	Type	Hits	Search Text
1	BRS	144	download$3 near3 program$4 near4 (mobile station)
2	BRS	44537	455/$.ccls.
3	BRS	41	(download$3 near3 program$4 near4 (mobile station)) and 455/$.ccls.
4	BRS	2	((download$3 near3 program$4 near4 (mobile station)) and 455/$.ccls.) and (download$3 near5 select$3 near5 program$4 near4 (mobile station))
5	BRS	16	download$3 near5 select$3 near5 program$4 near4 (mobile station)
6	BRS	464	download$3 near5 program$5 near5 (terminal mobile station)
7	BRS	70	455/$.ccls. and (download$3 near5 program$5 near5 (terminal mobile station))
8	BRS	529	select$3 near3 program$4 near4 (mobile station)
9	BRS	18	(455/$.ccls. and (download$3 near5 program$5 near5 (terminal mobile station))) and (select$3 near3 program$4 near4 (mobile station))
10	BRS	0	(download$3 near3 program$4 near4 (mobile station)) with internetwork$3 and 455/$.ccls.
11	BRS	0	select$3 near5 program$4 near5 (mobile station) near5 internetwork$3
12	BRS	22793	(first and second) near5 network
13	BRS	8	download$3 near3 program$4 near4 (mobile station) and ((first and second) near5 network)
14	BRS	382	manag$3 near5 operat$4 near5 (mobile terminal)
15	BRS	2	manag$3 near5 operat$4 near5 (mobile terminal) near5 mode
16	BRS	105	455/$.ccls. and (manag$3 near5 operat$4 near5 (mobile terminal))
17	BRS	68243	select$3 near3 mode

	Type	Hits	Search Text
18	BRS	8	(455/$.ccls. and (manag$3 near5 operat$4 near5 (mobile terminal))) and (select$3 near3 mode)
19	BRS	5059	select$3 near3 mode near3 automatic$4
20	BRS	171	455/$.ccls. and (select$3 near3 mode near3 automatic$4)
21	BRS	14833	display$3 near3 (service instruction)
22	BRS	16	(455/$.ccls. and (select$3 near3 mode near3 automatic$4)) and (display$3 near3 (service instruction))

US005903832A

United States Patent [19]

Seppanen et al.

[11] Patent Number: 5,903,832

[45] Date of Patent: May 11, 1999

[54] **MOBILE TERMINAL HAVING ENHANCED SYSTEM SELECTION CAPABILITY**

[75] Inventors: **Jorma Seppanen**, Oulu; **Juha Vaihoja**, Tupos; **Mikko Lietsalmi**; **Jaakko Vanttila**, both of Oulu, all of Finland

[73] Assignee: **Nokia Mobile Phones Llimited**, Salo, Finland

[21] Appl. No.: **08/576,260**

[22] Filed: **Dec. 21, 1995**

[51] **Int. Cl.**[6] **A63B 67/00**

[52] **U.S. Cl.** **455/414**; 455/412; 455/432; 455/435; 455/551

[58] **Field of Search** 455/412, 414, 455/421, 432, 433, 434, 435, 436, 437, 525, 186.1, 551, 552

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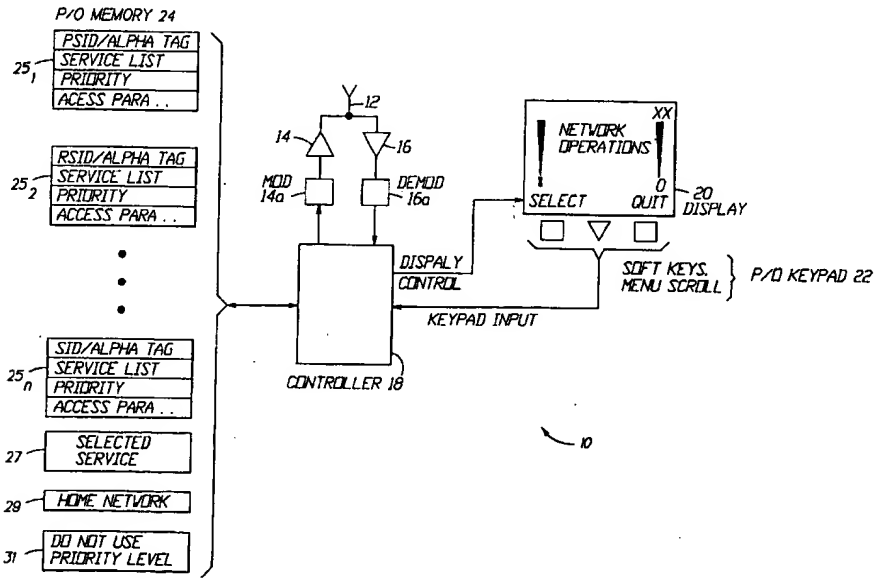
Primary Examiner—Wellington Chin
Assistant Examiner—Keith Ferguson
Attorney, Agent, or Firm—Perman & Green, LLP

[57] **ABSTRACT**

A mobile station (**10**) maintains a single, prioritized list of all available networks (i.e., all public, residential, and private networks). Access to the various networks is then based on the user's needs. A first type of access is an automatic access, that requires little or no user involvement. A second type of access is to a user-specified network. A third type of access is to a user-specified service (e.g., data, fax, e-mail, etc.) that is supported by at least one of the networks. The mobile station can search for additional networks, and can also search for additional networks that support only a specified type of service, or for a network that supports a service not supported by networks that are already in the list. All of the networks can be searched at once so that the user can readily make a selection from the single, prioritized network list. The network priorities are user programmable by moving network names up and down in the list using a mobile station user interface, such as the mobile station's keypad. The higher the network name is placed in the list, the higher is the priority of the network.

27 Claims, 10 Drawing Sheets



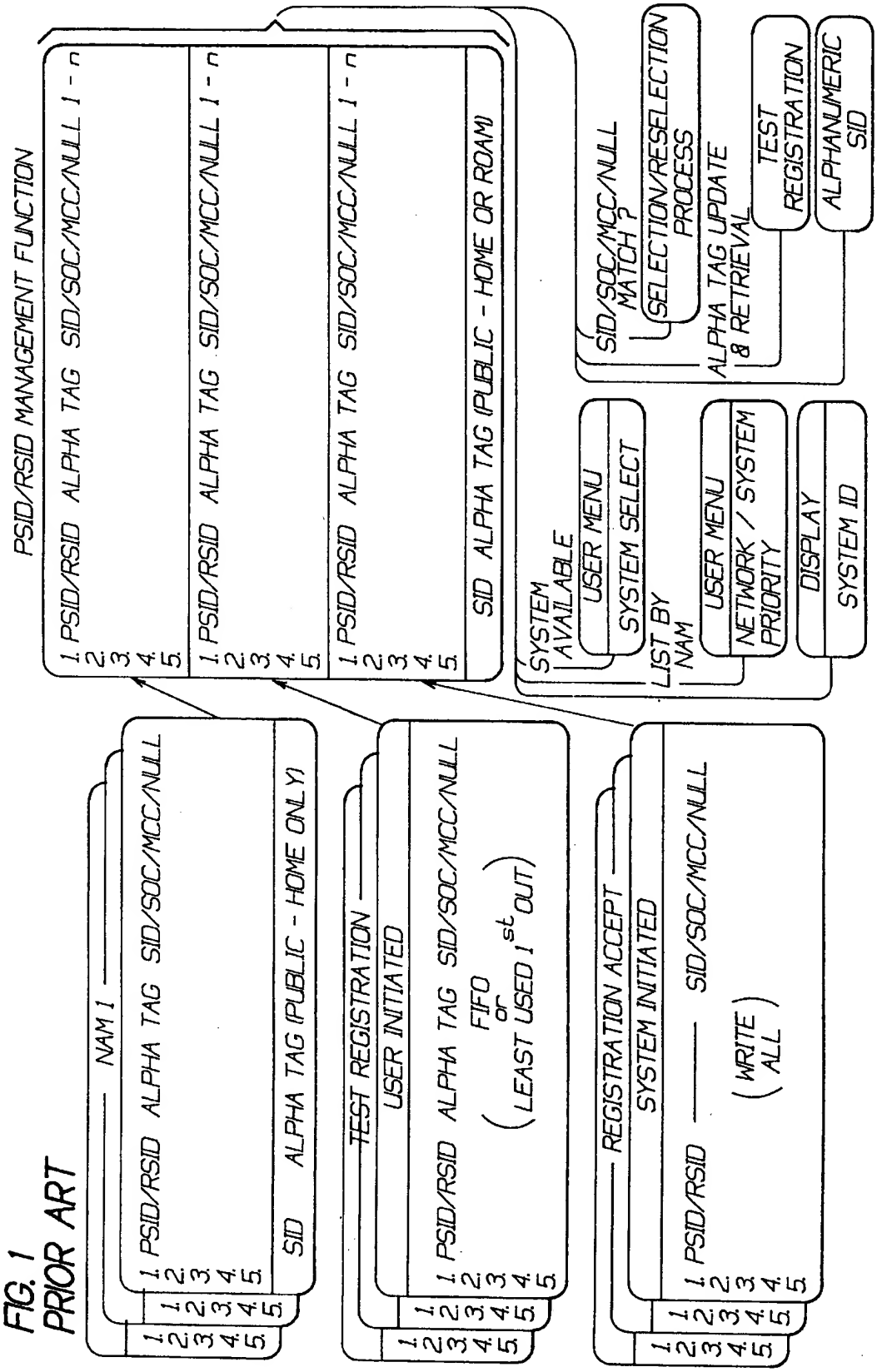


FIG. 1
PRIOR ART
NAM 1
1 PSID/RSID ALPHA TAG SID/SOC/MCC/NULL
SID ALPHA TAG (PUBLIC - HOME ONLY)
TEST REGISTRATION
USER INITIATED
1 PSID/RSID ALPHA TAG SID/SOC/MCC/NULL
FIFO
or
(LEAST USED 1st OUT)
REGISTRATION ACCEPT
SYSTEM INITIATED
1 PSID/RSID —— SID/SOC/MCC/NULL
(WRITE ALL)
PSID/RSID MANAGEMENT FUNCTION
1 PSID/RSID ALPHA TAG SID/SOC/MCC/NULL 1 - n
SID ALPHA TAG (PUBLIC - HOME OR ROAM)
SYSTEM AVAILABLE
USER MENU
SYSTEM SELECT
LIST BY NAM
USER MENU
NETWORK / SYSTEM PRIORITY
DISPLAY
SYSTEM ID
SID/SOC/MCC/NULL MATCH ?
SELECTION/RESELECTION PROCESS
ALPHA TAG UPDATE & RETRIEVAL
TEST REGISTRATION
ALPHANUMERIC SID

FIG. 2A

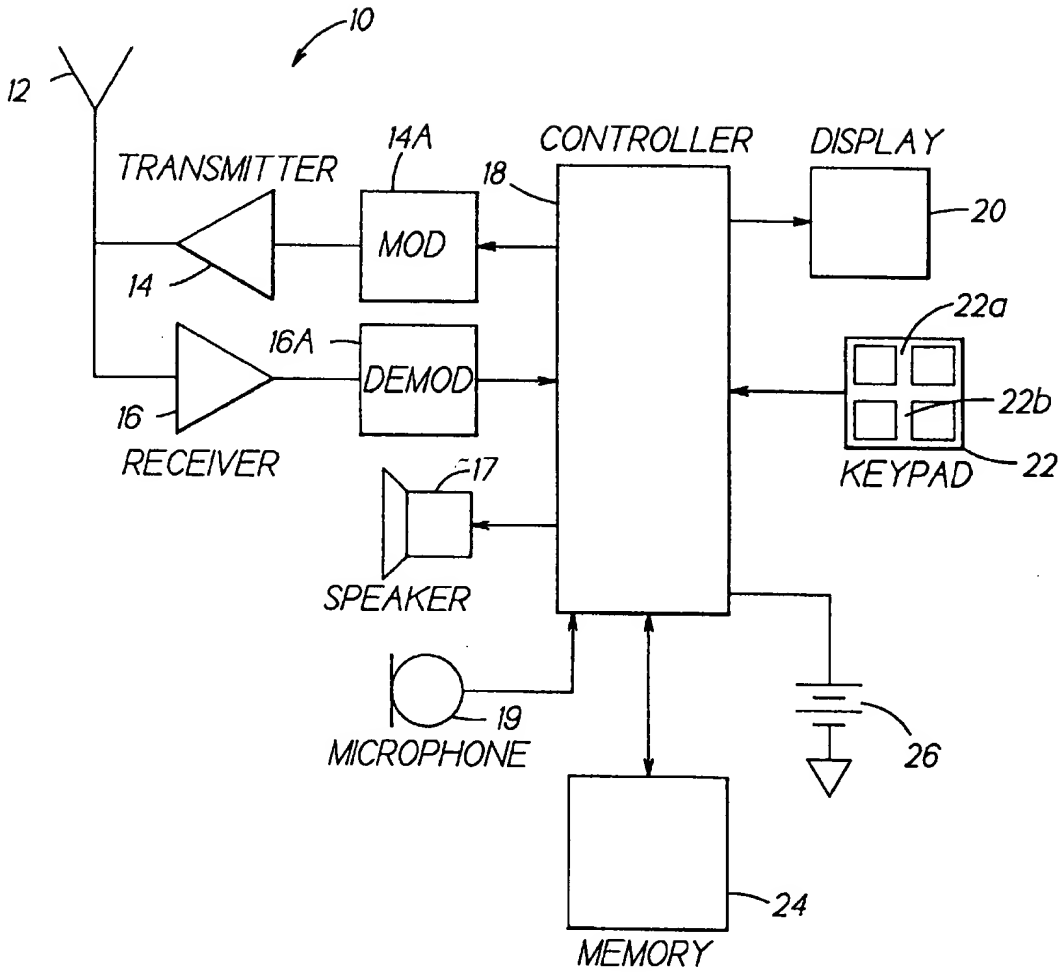
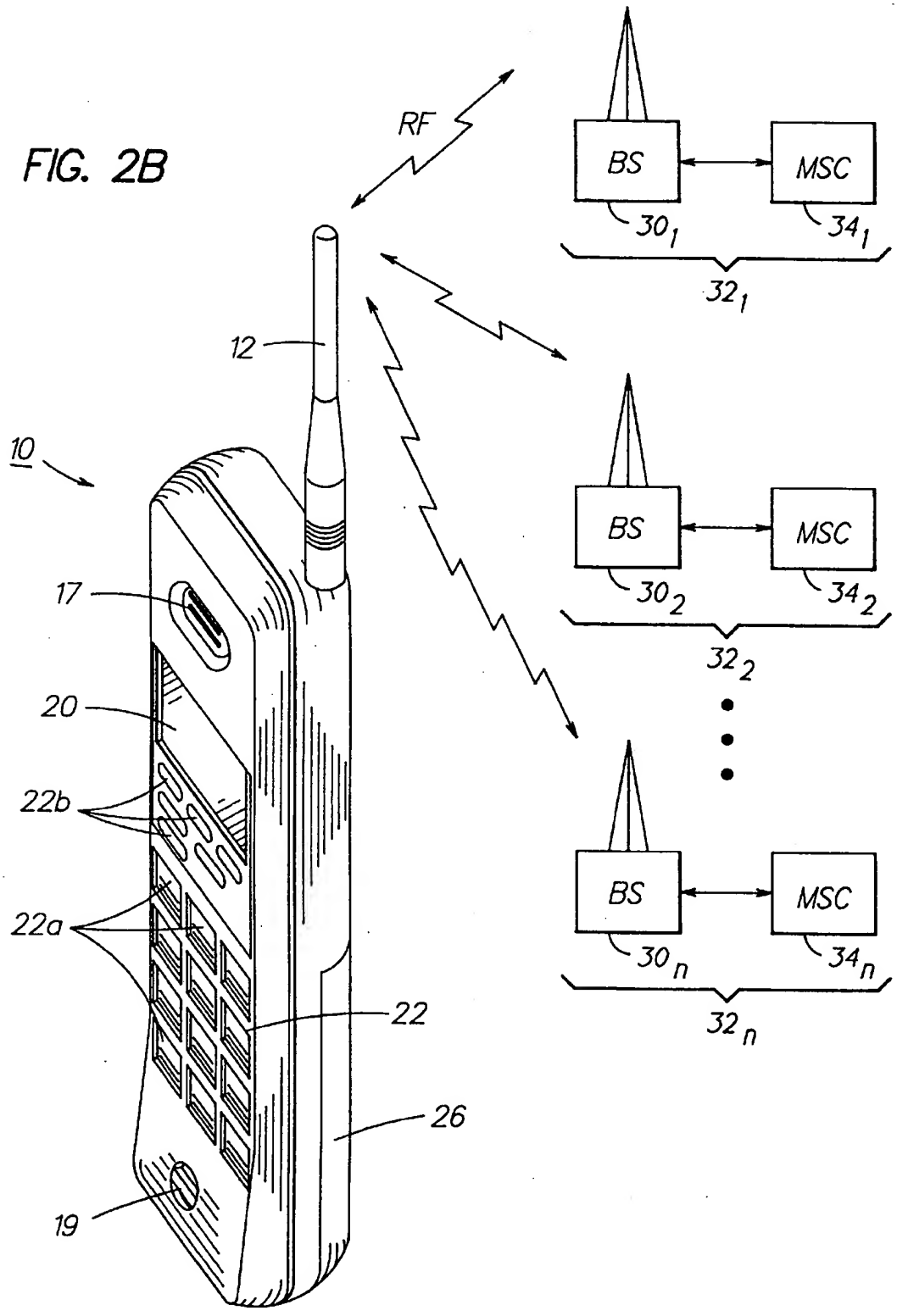

10
12
TRANSMITTER
14A
MOD
14
16A
DEMOD
16
RECEIVER
18
CONTROLLER
DISPLAY
20
22a
22b
22
KEYPAD
17
SPEAKER
19
MICROPHONE
26
24
MEMORY

FIG. 2B


RF
BS
MSC
30 1
34 1
32 1
12
10
BS
MSC
30 2
34 2
32 2
17
20
22b
22a
BS
MSC
30 n
34 n
32 n
22
26
19

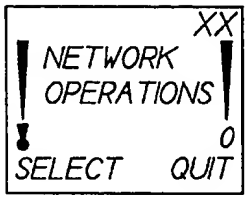


FIG. 3A

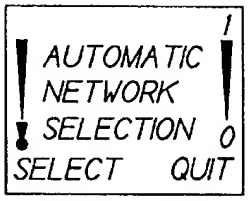


FIG. 3B

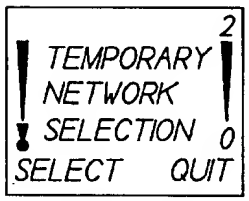


FIG. 3C

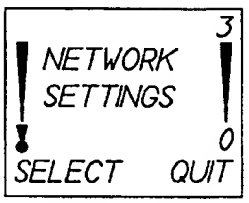


FIG. 3D

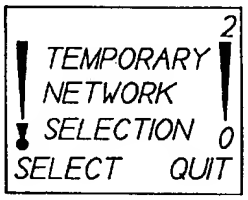


FIG. 4A

SELECT

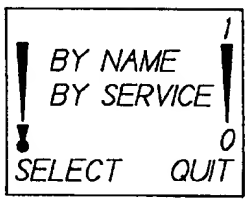


FIG. 4B

FIG. 5A

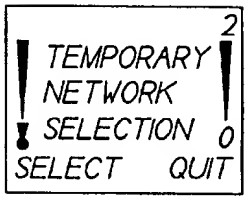


FIG. 5B

SELECT

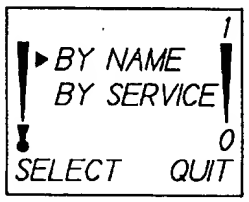


FIG. 5C

SELECT

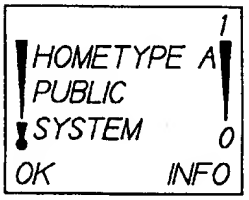
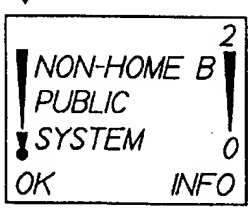


FIG. 5D



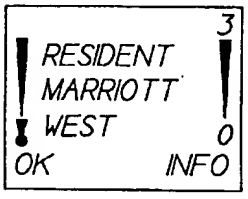


FIG. 5E

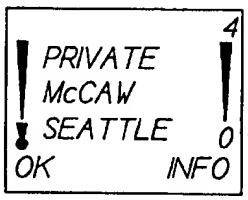


FIG. 5F

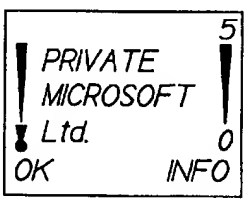


FIG. 5G

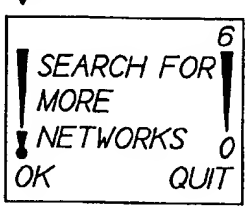


FIG. 5H

FIG. 6A

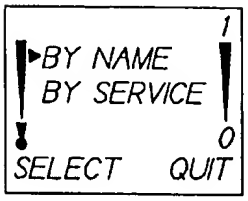


FIG. 6B

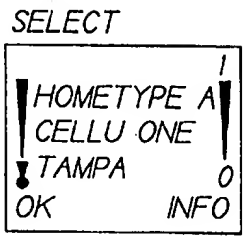


FIG. 6C

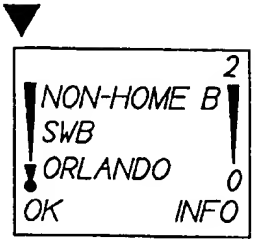
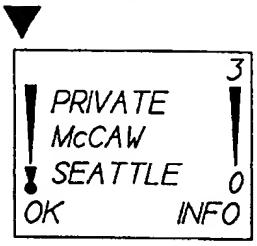


FIG. 6D



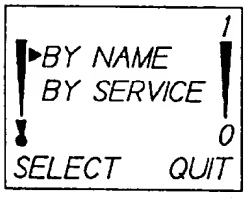


FIG. 7A

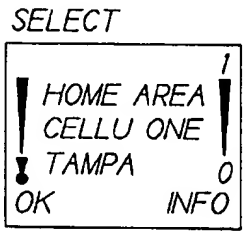


FIG. 7B

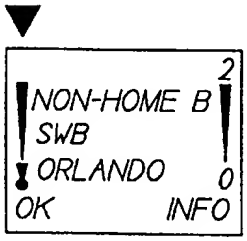


FIG. 7C

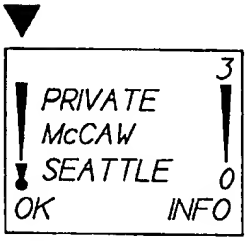


FIG. 7D

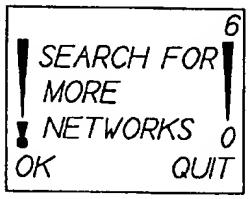


FIG. 8A

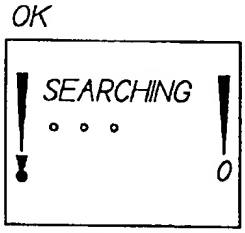


FIG. 8B

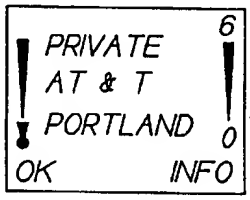
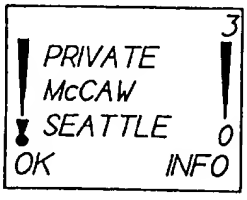


FIG. 8C

FIG. 9A



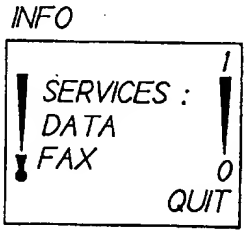
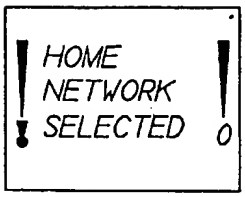


FIG. 9B

FIG. 10



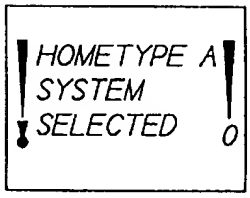


FIG. 11A

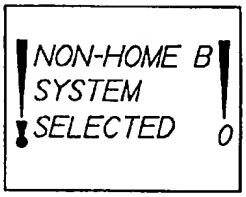


FIG. 11B

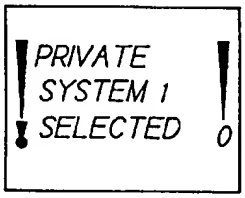


FIG. 11C

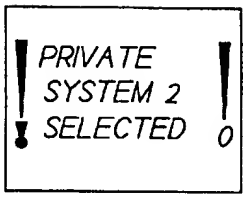


FIG. 11D

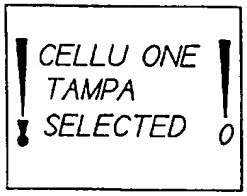


FIG. 12A

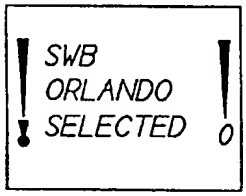


FIG. 12B

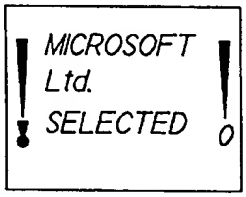
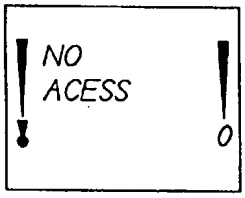


FIG. 12C

FIG. 13



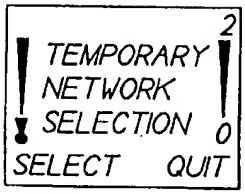


FIG. 14A

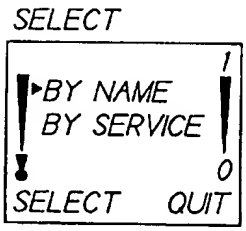


FIG. 14B

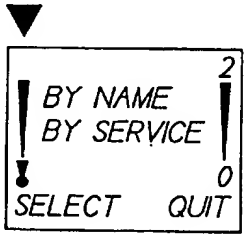


FIG. 14C

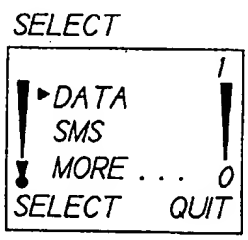


FIG. 14D

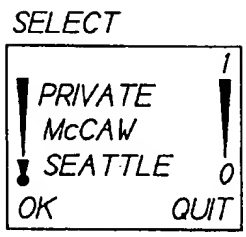


FIG. 15A

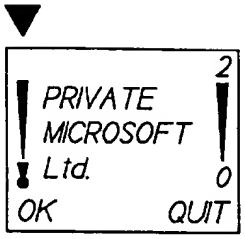
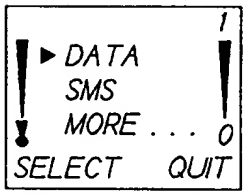


FIG. 15B

FIG. 15C



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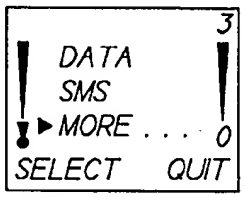


FIG. 16B

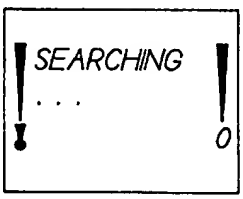


FIG. 16C

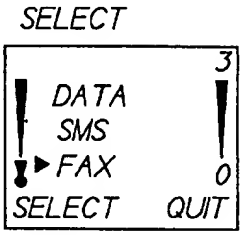


FIG. 16D

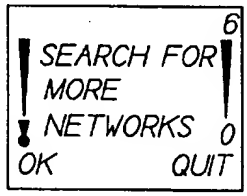


FIG. 17A

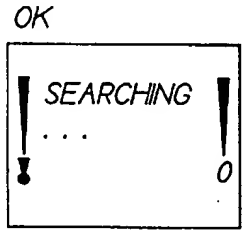


FIG. 17B

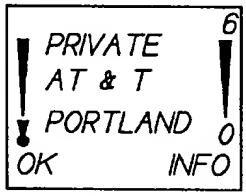


FIG. 17C

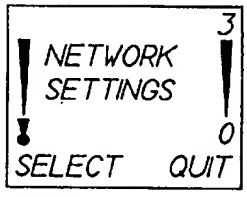


FIG. 18A

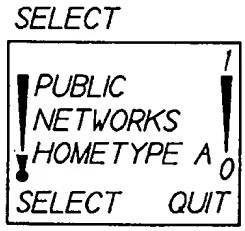


FIG. 18B

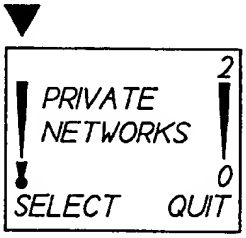


FIG. 18C

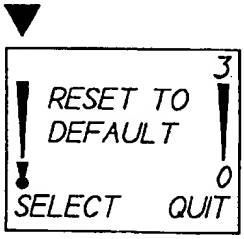


FIG. 18D

FIG. 19A

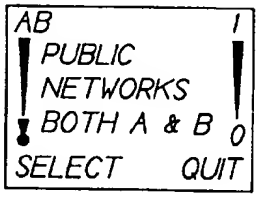


FIG. 19B

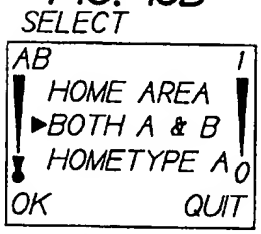


FIG. 19C

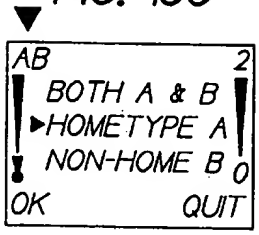
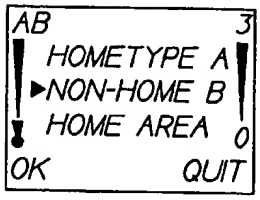


FIG. 19D



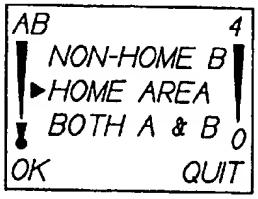


FIG. 19E

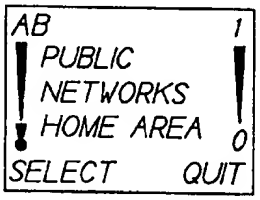


FIG. 19F

FIG. 20A

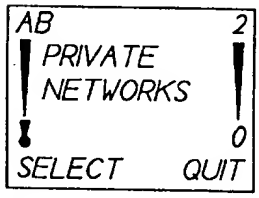


FIG. 20B

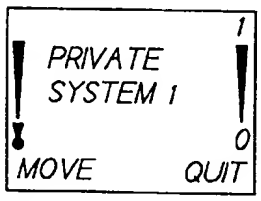


FIG. 20C

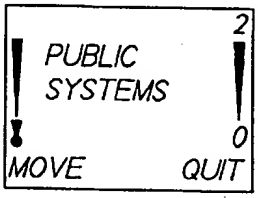
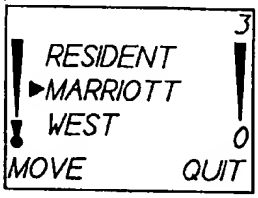


FIG. 20D



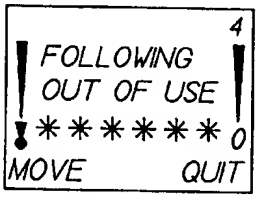


FIG. 20E

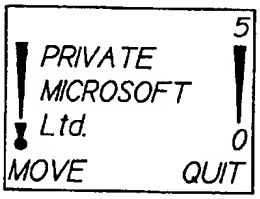


FIG. 20F

FIG. 21A

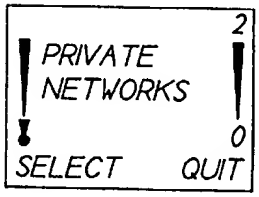


FIG. 21B

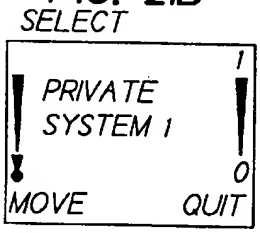


FIG. 21C

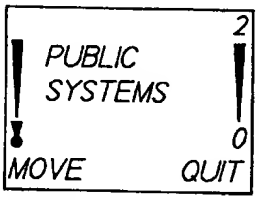
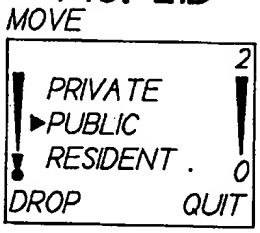


FIG. 21D



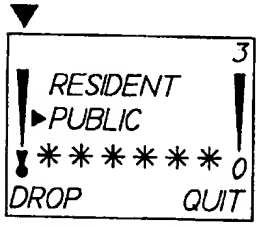
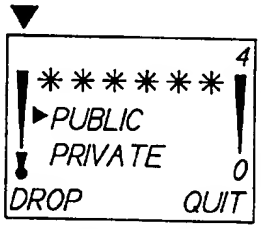


FIG. 21E



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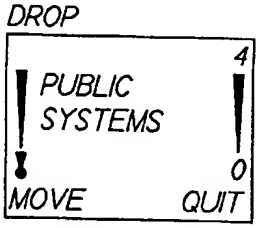

FIG. 21G

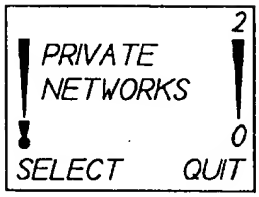

FIG. 22A

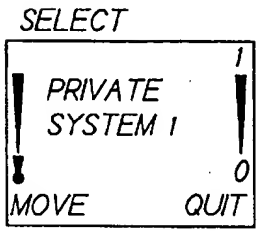

FIG. 22B

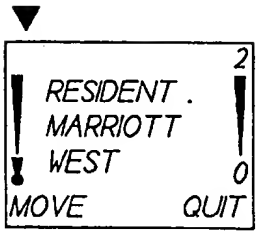

FIG. 22C

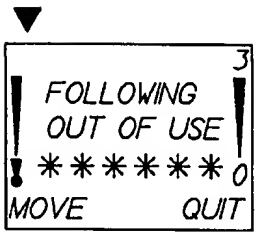

FIG. 22D

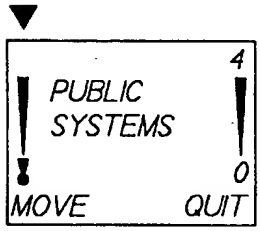

FIG. 22E

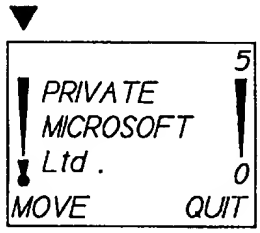

FIG. 22F

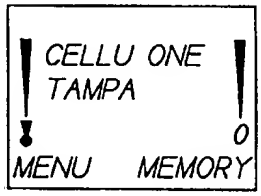

FIG. 23A

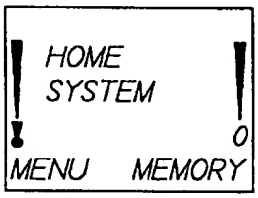

FIG. 23B

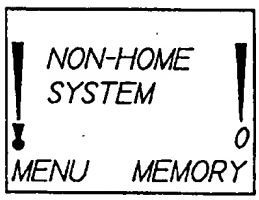

FIG. 23C

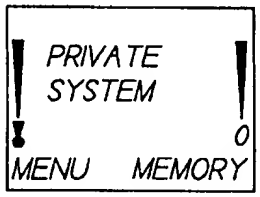

FIG. 23D

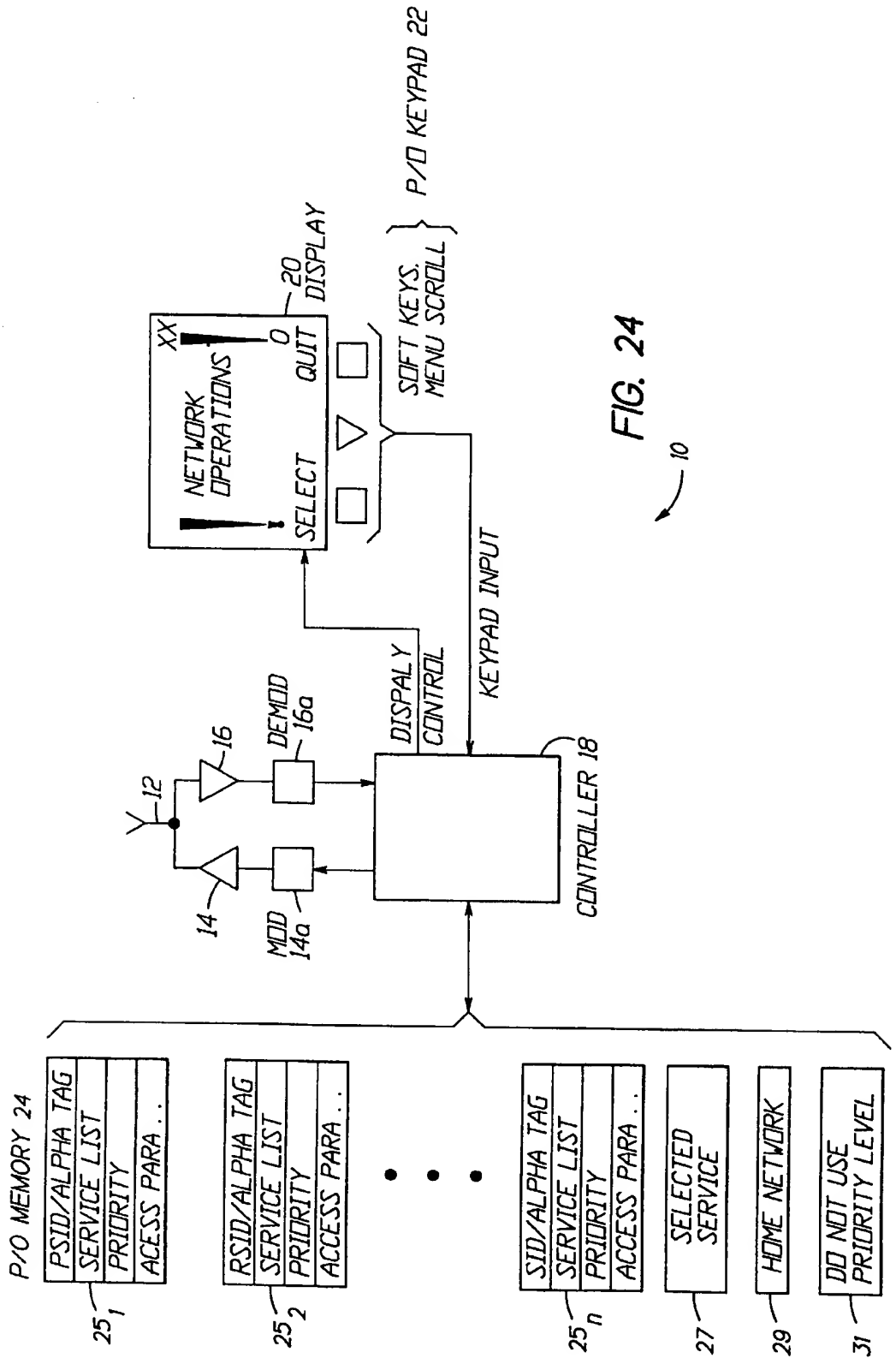
P/O KEYPAD 22
20 DISPLAY
XX
NETWORK OPERATIONS
0 QUIT
SELECT
SOFT KEYS, MENU SCROLL
DISPLAY CONTROL
KEYPAD INPUT
CONTROLLER 18
DEMOD 16a
MOD 14a
16
14
12
10
P/O MEMORY 24
PSID/ALPHA TAG
SERVICE LIST
PRIORITY
ACESS PARA . .
25 1
RSID/ALPHA TAG
SERVICE LIST
PRIORITY
ACCESS PARA . .
25 2
SID/ALPHA TAG
SERVICE LIST
PRIORITY
ACCESS PARA . .
25 n
SELECTED SERVICE
27
HOME NETWORK
29
DO NOT USE PRIORITY LEVEL
31

FIG. 24

MOBILE TERMINAL HAVING ENHANCED SYSTEM SELECTION CAPABILITY

FIELD OF THE INVENTION

This invention relates generally to radiotelephones and, in particular, to mobile terminals such as those capable of operation with a cellular network.

BACKGROUND OF THE INVENTION

Communications between two cellular radiotelephone (also referred to herein as a mobile terminal and a mobile station) users is established using cellular systems. By example, in the Time Division, Multiple Access (TDMA) system known as IS-136 (IS-136.1, Rev. 0, May 17,1995) various network systems are classified into three groups: public, private, and residential networks. Private and residential networks may also be referred to as non-public networks. Typically, there are two public cellular systems in one geographical area. In addition, there may be one or more non-public cellular systems available to users within the same geographical area. Also, service providers operating in other bands, such as the 1900 MHz band, may also be available.

The two public cellular systems within one geographical area are conventionally referred to as the A-system and the B-system. For example, in both the New York and Los Angeles metropolitan areas there are two public cellular systems. Each of these systems has its own unique identity, referred to as the SID (System Identification).

Generally, the cellular radiotelephone can operate at any given time in one of the two available public systems, and a display of the radiotelephone will typically have indicators (i.e., A and B icons) for indicating to the user which system is currently being used.

One of the public systems is always referred to as the "home system" of the radiotelephone, or more specifically as the home system of the radiotelephone's Number Assignment Module (NAM). Whether the home system is A-type or B-type depends on the parameters of the currently selected NAM.

One purpose of non-public systems is to provide specialized telecommunications services to radiotelephone users. The primary non-public system types include Wireless Business Systems, Limited Service Areas, and Residential Cellular Telephones.

In the Wireless Business System (WBS) application, connections for a closed group of users are typically switched through an existing PBX or through the public switched telephone network (PSTN). This type of system provides capabilities for offering specific features that can be highly integrated with other telecommunications services used by the group, with the goal of providing all of the capabilities of a desk telephone. Examples of these services include: voice mail integrated into an existing wired PBX; centralized speed dial lists; and simplified private network access.

In the Limited Service Area (LSA) application, a closed group of users may receive special billing considerations and custom features and services while within the coverage range of the private or semi-private system. Public subscribers not belonging to the closed group would receive service at standard billing rates. An LSA may be deployed at shopping malls, airports, sports facilities, hotels, etc. Full-time staff at such a facility may subscribe to the LSA service, while customers and itinerant visitors receive standard public wireless service over the same network.

The Residential Cellular Telephone (RCT) application is intended for use within a residence, and functions as an enhanced wireless telephone set. The RCT application is intended to provide users with a single handset which can be used as a cordless telephone when operated in conjunction with a home or neighborhood base station within a residential or office environment. The RCT application is also intended to provide a standard cellular mobile station when operating within the cellular environment, or as part of a Wireless Business System (WBS). When the handset is used as a conventional cordless telephone, the associated home or neighborhood base station communicates with the cellular network to assure that a user's calls are automatically forwarded to the user's landline telephone number.

In a document entitled "TDMA Forum, Implementation Guide: Non-Public Mode Operation and Selection in IS-136 Compliant Mobile Stations", Version 2.0, Mar. 9, 1995, a number of system operators have described non-public mode and selection requirements for mobile stations compliant with TIA Interim Standards IS-136 and IS-137. The document is said not to mandate any specific implementation, but instead to promote a similar level of services for all mobile station users.

FIG. 1 is based on FIG. 1.3-1 of the above-referenced TDMA Forum document, and illustrates a mobile station reference model for non-public mode operation. More particularly, FIG. 1 illustrates the various elements required to support the loading and management of PSIDs/RSIDs in an IS-136 compatible mobile station. To facilitate the discussion, the following conventions are used.

PSID is the numeric value of a Private System ID. A PSID is always be associated with the appropriate System Identification Code (SID), System Operator Code (SOC), Mobile Country Code (MCC), or International status (Null), according to Section 8.3.4 of IS-136, during the process of storage or verification.

RSID is the numeric value of a Residential System ID. An RSID should always be associated with the appropriate SOC, MCC, or International status (Null), according to Section 8.3.5 of IS-136, during the process of storage or verification.

Alpha Tag is an alphanumeric designator associated with a PSID/RSID. This designator may be used when a user is alerted or is presented a choice regarding a specific PSID/RSID. The numeric PSID/RSID values are said to be used solely for the Selection/Reselection processes, and should not be presented to the user. The alphanumeric designator (i.e., the Alpha Tag) is derived from either a Test Registration Alphanumeric PSID/RSID, from an alphanumeric tag entered with the PSID/RSID during NAM programming, or from a default Alpha Tag used if neither of the previous two sources are available.

In a similar manner, the term Alpha Tag is used to refer to the alphanumeric designator associated with a given SID, whether the designation is derived from the Alphanumeric SID available from the system or is derived from an Alpha Tag entered during NAM programming. The numeric SID is not presented to the user, but rather, the Alpha Tag associated with the SID.

The MS Reference Model for Non-Public Mode Operation of FIG. 1 is divided into three major functions: (1) PSID/RSID acquisition, (2) user review and selection of PSIDs/RSIDs, and (3) the selection and reselection processes. These three elements are said to be administered by a common PSID/RSID Management Function. As presented, FIG. 1 is intended to aid in describing the storage, display, prioritization, and selection of PSIDs/RSIDs.

The management of the storing, displaying, selecting, and prioritizing PSIDs/RSIDs is facilitated by constructing a list within a PSID/RSID logical management block. Each list is NAM specific and is dynamic with respect to the fact that it is reconstructed or updated each time the contents of a corresponding NAM, Test Registration, or Registration Accept PSID/RSID list changes. The "common" PSID/RSID list is called upon to support the selection/reselection processes; for two user menu functions, System Select and Network Priority; and for a System ID display function. As previously described, the numeric PSIDs/RSIDs residing in this list are used for the selection/reselection process, while the Alpha Tags linked to these PSIDs/RSIDs are used for all user interactions.

The storage and purpose of each PSID/RSID acquisition method is unique. NAM programmed PSIDs/RSIDs are intended to be entered by a service technician and will be, in general, permanent, although their Alpha Tags may be updated. The Test Registration method is invoked by the user and is primarily used for acquiring new PSIDs/RSIDs. Each PSID/RSID acquired by a Test Registration is stored individually and replaces a previously stored PSID/RSID within the Test Registration storage area if the storage area is full. Finally, the Registration Accept method is system initiated and can automatically load a PSID/RSID set without any user interaction. For this method, a new list overwrites any previously stored PSIDs/RSIDs within the Registration Accept storage area. As FIG. 1 depicts, each NAM supporting non-public mode operation will have one of each of these three storage areas.

As can be appreciated, as the complexity of cellular telephone networks increases, and as user's are given more options for communicating through various systems, including public and non-public systems, it has become important to provide a simple and efficient user interface enabling a user to manage, prioritize, and select between available systems.

OBJECTS OF THE INVENTION

It is thus a first object of this invention to provide an efficient and simple technique for enabling a user of a mobile terminal or station to manage, prioritize, and select between available systems.

It is a second object of this invention to provide a mobile terminal or station to having automatic network selection capability, temporary network selection capability by network name or network capability (e.g., data, fax, e-mail, etc.), and a capability for setting parameters and priorities of networks.

SUMMARY OF THE INVENTION

The foregoing and other problems are overcome and the objects of the invention are realized by methods and apparatus in accordance with embodiments of this invention.

In accordance with an aspect of this invention a mobile station maintains a single, prioritized list of all available networks (i.e., all public, residential, and private networks). Access to the various networks is based on the user's needs. A first type of access is an automatic access, that requires little or no user involvement. A second type of access is to a user-specified network. A third type of access is to a user-specified service (e.g., data, fax, e-mail, etc.) that is supported by at least one of the networks. The mobile station can search for additional networks, and can also search for additional networks that support only a specified type of service, or for a network or networks that support a type of service not supported by networks that are already in the list. All of the networks can be searched at once so that the user can readily make a selection from the single, prioritized network list.

In the first type of access the mobile station selects any available network, wherein the home area network has the highest priority, a second highest priority is reserved for home-type networks, and a third highest priority is reserved for non-home type networks. Any private networks that may be available are not selected unless programmed to do so. The mobile station may indicate the presence of private networks by displaying a notification and/or outputting an audible signal. If an allowed residential network is available, it is selected automatically. A default network priority order is residential, private, and public.

In accordance with a further aspect of this invention the network priority is programmed by moving network names up and down in the list using a mobile station user interface, such as the mobile station's keypad and display. The higher the network name is placed in the list, the higher is the priority of the network. Also, generic network names (e.g., HOME AREA, HOME-TYPE, NON-HOME PRIVATE 1, PRIVATE 2, RESIDENT 1 and RESIDENT 2) can be used. The prioritized list is then used in the automatic selection of the networks. The higher the priority the more likely it is that the network is selected for use. If a given network is set so as to be not used, the network is not selected except in an emergency call situation.

The second type of access (i.e., locate a specific network) is especially beneficial since some networks may have lower rates that the others. In this case the user is presented with the list of the all available networks, including public, private and residential networks. If the user selects a specific network name from the list, the user can then obtain further information related to that network by pressing an appropriate key/soft key. The network can also be selected for registration through the use of a key/soft key.

The third type of access (i.e., locate a specific service) is beneficial when the user is required to select a specific service. By example, only some available networks may offer data services, or data services having a desired bit transfer rate. The solution in accordance with this invention is that the end user is presented a list of all of the available services in all available networks. In this case the user is enabled to select a specific service type from a list of service types, and all available networks that support the selected service type are then displayed. Any one of the displayed supporting networks can then be selected. When a particular type of service is selected, it is also within the scope of this invention to search for additional networks, and to display to the user only those newly found networks that support the selected type of service.

BRIEF DESCRIPTION OF THE DRAWINGS

The above set forth and other features of the invention are made more apparent in the ensuing Detailed Description of the Invention when read in conjunction with the attached Drawings, wherein:

FIG. 1 illustrates a prior art mobile station reference model for non-public mode operation;

FIG. 2A is a block diagram of a mobile station that is constructed and operated in accordance with this invention;

FIG. 2B is an elevational view of the mobile station shown in FIG. 2A, and which further illustrates a plurality of cellular communication networks to which the mobile station can be bidirectionally coupled through wireless RF links;

FIGS. 3A–23D illustrate various menu and other displays that are presented to the user during the use of the teaching of this invention; and

FIG. 24 is further block diagram of the mobile station that is useful in describing the operation of the mobile station as reflected in the various displays shown in FIGS. 3A to 23D.

DETAILED DESCRIPTION OF THE INVENTION

Reference is made to FIGS. 2A and 2B for illustrating a mobile terminal or station **10**, in particular a cellular radiotelephone, that is suitable for practicing this invention. The mobile terminal **10** includes an antenna **12** for transmitting signals to and for receiving signals from one of a plurality of base sites or base stations $\mathbf{30}_1$–$\mathbf{30}_n$. Each base station **30** is a part of an associated cellular system or network $\mathbf{32}_1$ to $\mathbf{32}_n$, each of which may include or be connected to a mobile switching center (MSC) **34**. The MSC **34** is capable of routing messages to and from the user terminal **10** when the user terminal is registered with the network. Each of the networks is associated with a particular type of network provider or operator, and will generally be public or non-public systems or networks, as was described above. By example, one of the base stations **30** may be residential base station providing service within the user's home, while another one of the base stations **30** may be a public base station providing service over a large geographical area. For this latter case a plurality of the base stations **30** are typically provided, each having a coverage area that overlaps a coverage area of at least one other base station.

The mobile terminal includes a modulator (MOD) **14A**, a transmitter **14**, a receiver **16**, a demodulator (DEMOD) **16A**, and a controller **18** that provides signals to and receives signals from the transmitter **14** and receiver **16**, respectively. These signals include signalling information in accordance with the air interface standard of the applicable cellular system, and also user speech and/or user generated data. The air interface standard is assumed for this invention to include a digital control channel (DCCH), and to support Test Registrations and the identification of PSIDs and RSIDs. A presently preferred air interface standard is that specified by IS-136.1, Rev. 0, May 17, 1995, although the teaching of this invention is not limited to only this one particular standard.

The Test Registration capability of IS-136 is described in Section 6.3.14 (Non-Public System Selection). It is noted that in this section it is recommended that the mobile station **10** be capable of dynamically ranking Network Types so that it may attempt registration based on subscriber defined preference order. The system response to the Test Registration is specified in Section 6.4.3.21. Fields in this response message include the Alphanumeric System ID and the Alphanumeric PSID/RSID List.

A user interface includes a conventional speaker **17**, a conventional microphone **19**, a display **20**, and a user input device, typically a keypad **22**, all of which are coupled to the controller **18**. The keypad **22** includes the conventional numeric (**0**–**9**) and related keys (#, *) **22***a*, and also other keys **22***b* used for operating the mobile terminal **10**. These other keys **22***b* include, by example, a SEND key, various menu scrolling and soft keys, and a PWR key.

The mobile terminal **10** also includes various memories, shown collectively as the memory **24**, wherein are stored a plurality of constants and variables that are used by the controller **18** during the operation of the mobile terminal. For example, the memory **24** stores the values of various cellular system parameters and the number assignment module (NAM). An operating program for controlling the operation of controller **18** is also stored in the memory **24** (typically in a ROM device). The memory **24** also stores data, including user messages, that are received from the cellular network **32** prior to the display of the messages to the user. The mobile terminal **10** also includes a battery **26** for powering the various circuits that are required to operate the terminal.

It should be understood that the mobile terminal **10** can be a vehicle mounted or a handheld device. It should further be appreciated that the mobile terminal **10** can be capable of operating with one or more air interface standards, modulation types, and access types. By example, the mobile terminal may be capable of operating in accordance with a frequency modulated (FM), frequency division multiple access (FDMA) transmission and reception standard, such as one known as EIA/TIA-553 (AMPS). The terminal may also be capable of operating with any of a number of other analog or digital standards, such as GSM, EIA/TIA 627 (DAMPS), IS-136 (DAMPS), and IS-95 (CDMA). Narrowband AMPS (NAMPS), as well as TACS, mobile terminals may also benefit from the teaching of this invention. Also, terminals operating in accordance with various DCS, TDMA and CDMA 1900 MHz standards are within the scope of this invention, as are dual mode (e.g., 800 MHz/1900 MHz) terminals. In general, the teaching of this invention applies to any radiotelephone terminal that is capable of receiving messages from a system, that includes a display for displaying messages and a menu of mobile terminal functions to a user, and that furthermore includes a user input device, such as a keypad, with which the user can generate messages and also interact with the displayed menu to select various mobile terminal functions. It should thus be clear that the teaching of this invention is not to be construed to be limited to any one particular type of mobile terminal or air interface standard.

In general, the operating program in the memory **24** includes routines to present messages and message-related functions to the user on the display **20**, typically as various menu items. The memory **24** also includes routines for implementing the method described below in relation to FIGS. 3A through 23D.

Reference is now made to FIGS. 3A through 23D for illustrating various displays presented on the display **20** of FIGS. 2A and 2B; these drawing figures being useful in explaining the various methods in accordance with this invention. Although these methods will be described in the context of one existing interim cellular digital standard (i.e., IS-136), the teaching of this invention is not limited for use only with this one particular interim standard.

It is first noted that in FIGS. 3A through 23D the icon shown on the left of the display is a received signal strength indicator, and the icon shown on the right of the display is a battery level indicator. Neither of these icons forms a part of the teaching of this invention. The number shown in the upper right portion of the display indicates the level of the display (i.e., the menu number). The symbol ▼ above a display indicates that a down arrow menu scrolling key is depressed to move a display cursor down by one menu item.

Since there may be more than one system available when the mobile station **10** is used, the mobile station **10** must be able to select a system to register to. There are two system select modes available, mainly AUTOMATIC MODE and TEMPORARY MANUAL MODE, both of which are explained in detail below. Once the user has selected a

system manually, the selection remains in effect until one of the following events occurs: the signal strength is too low; a call ends; the mobile station **10** is powered off and then on; the user cancels the manual system selection by selecting the AUTOMATIC NETWORK SELECTION menu; the user selects another system using the TEMPORARY NETWORK SELECTION mode; or the active NAM is changed. In all cases mentioned above, the automatic mode is selected as a default mode of operation.

In the automatic mode the mobile station **10** automatically selects one of the available systems. If coverage is lost, the automatic selection procedure is restarted without requiring any user action. A system is selected primarily using the priorities defined as to the different network types. If there are several systems with the same priority available, then one of thethe received sigcted according to the received signal strength. That is, the system having the highest received signal strength is selected.

The priority order of the different network types as default are as follows (highest priority first): residential systems; private systems; and public systems. The priority order of the different public systems depends on the PUBLIC NETWORKS menu selection, as described below with regard to FIGS. **19**A through **19**F.

In the temporary manual mode the user can choose any of the available and allowed non-public or public systems to use. It should be noted that even those networks that are barred by the PRIVATE NETWORKS menu item are allowed. When registered to a manually selected system and the mobile station **10** loses contact to the selected system, the mobile station **10** changes to the automatic selection mode automatically, i.e., it selects automatically the highest priority system of the available systems.

The system selection main menu screen **20***a* is shown in FIG. **3**A, and is referred to herein as Network Operations. The Network Operations menu has three submenus (designated **1**–**3**), as shown in FIGS. **3**B–**3**D.

With regard to the Automatic Network Selection menu of FIG. **3**B, if the user has made a temporary system selection and desires to return to automatic selection (using priority lists), the user can select the AUTOMATIC NETWORK SELECTION option. If this option is selected the mobile station **10** performs the automatic selection procedure as described above and exits the menu. This mode is used to exit from the manual network selection mode. The return to automatic selection is also performed when the mobile station **10** is powered on, service is lost, or a call ends, as described above.

There are two choices in the Temporary Network Selection menu (FIG. **3**C), which is shown also in FIGS. **4**A, **5**A, and **14**A. As shown in FIG. **4**B, these two choices are "By Name" and "By Service".

If the user selects the By Name option (FIG. **5**B), and referring to FIGS. **5**C–**5**H, the mobile station **10** at first searches all available non-public systems from an internally maintained NAM list of neighboring systems. Next, and in addition to the available public systems, a list of available non-public systems is presented to the user. Only those systems are shown that are available without further network scanning. The list order is as follows: home-type public systems; non-home type public systems; non-public systems that are contained in the NAM list; and other systems, all of which are displayed in priority order. In the example shown in FIGS. **5**C–**5**H, the user's home system is assumed to be System A. If it were instead System B, the display text is changed accordingly. It should be noted that these general public system texts are used only if there is no Alpha Tag for the SID available (either from the network or from NAM programming fields). It should also be noted that FIGS. **5**E–**5**F depict several residential and private systems that do have available alpha tags.

If there is an Alpha Tag available for a public SID, it is displayed instead of the generic public system text, as is illustrated in FIGS. **6**B and **6**C.

If the system is the user's home system, it may be displayed so as to have a different header text, as shown in FIG. **7**B.

The last item in the network names list is Search for More Networks (FIGS. **5**H and **8**A). By selecting this item the mobile station **10** is caused to search for other networks (i.e., networks not already in the list) and to display these additional networks (if any are found) one by one. While searching the message shown in FIG. **8**B can be displayed to the user. The mobile station may attempt to Test Register with any located networks and, if successful, then displays any newly located network. An example of this is shown in FIGS. **8**A–**8**C.

Further in accordance with this invention, and before the user selects a system manually, the user can press an Information (Info) soft key on the keypad **22**. The mobile station **10** responds by displaying services available in the selected network, as depicted in FIGS. **9**A and **9**B. In this example the selected network has both Data and Facsimile services available. It is noted in this regard that Section 6.4.1.1.2.4 of IS-136.1 currently specifies a Service Menu as one type of F-BCCH (Fast Broadcast Control Channel) message. By receiving this or a similar message from a particular network the mobile station **10** can become aware of the services provided by the network.

After the user has manually selected a system, the mobile station **10** attempts to register to that system. If the registration is successful, the mobile station **10** displays the selected system, exits the Network Operations menu (FIG. **3**A), and returns to an idle state. If the selected system is the user's home system, it is indicated with the text shown in FIG. **10**, as opposed to the system name.

If the selected system is not the home system, and the Alpha Tag of the SID is not available, one of the exemplary messages shown in FIGS. **11**A–**11**D are displayed instead of the system name.

If the selected system is not the home system, and the system's name (SID's alpha tag from network or from NAM programming fields) is available, it is used as shown in the examples shown in FIGS. **12**A–**12**C.

If the registration attempt fails, the mobile station **10** may give an audible signal, displays the message shown in FIG. **13**, and goes back to the selection list (e.g., FIGS. **6**A or **7**A).

Further in accordance with this invention, when selecting a network instead by using the TEMPORARY NETWORK SELECTION menu (FIG. **3**C), a user is enabled to select a network by services provided by the networks, as is illustrated in FIGS. **14**A–**14**D and FIGS. **15**A–**15**C.

By example, in FIG. **14**C the user selects the By Service option. In response, the mobile station **10** displays a list of services available from networks already in the unified list of networks. In the example shown in FIG. **14**D, the services Data and Short Message Service (SMS) are displayed. By selecting Data, the user is presented with the displays shown in FIGS. **15**A–**15**C.

It should be noted that when displaying services, e.g. Data, SMS, etc., there is also a "More . . . " option as shown

in FIG. 14D. If the More option is selected by the user (FIG. 16B) the mobile station 10 responds by searching for other networks than those known previously by the mobile station 10 (FIG. 16C). If additional services are found, the newly found service names are added to the list as illustrated in FIG. 16D, where Fax has been added to Data and SMS.

The last item in the network names list (FIG. 15C) is Search for More Networks. By selecting this option (FIG. 17A) the mobile station 10 searches for other networks than those known previously by the mobile station 10 (FIG. 17B) and displays them one by one as shown in FIG. 17C.

In this regard it should be noted that only newly-found networks that support the currently selected service (i.e., Data, SMS, etc.) are displayed to the user.

The Network Settings menu item (FIG. 3D) is selected by the user for setting the priorities of the networks when the mobile station 10 employs uses the Automatic Network Selection option of FIG. 3B. If private networks are available then private network settings are preferred and given a higher priority than public networks. Reference in this regard can be had to FIGS. 18A–18D.

If the user selects the PUBLIC NETWORK SETTINGS option (FIG. 18B), the mobile station 10 presents four choices of public system priority selections from which to select. These are as follows.

Both A & B (FIG. 19B): In this mode the mobile station 10 first tries to use its home system. If it is not available it then tries to use the home-type of system. If the home-type of system is not available, a mobile station 10 tries to use the non-home type of system. The home system is the system associated with the currently selected NAM, and can be either an A-type or a B-type of system. A home-type of system is the same type as the home system, but in a different geographic area. For example, if the home system is B-type, then all B-type systems are home-type networks or systems.

Home-type A (FIG. 19C): If this mode is selected the mobile station 10 can only use the same type of system as the home system. The mobile station 10 will first try to use the home system, but if it is not available it will attempt to use an available home-type of system.

Non-home B (FIG. 19D): If this mode is selected the mobile station 10 can only use the non-home type of system (home area).

Home area (FIG. 19E): If this mode is selected the mobile station 10 can only use the home system (home area).

The user selects one of these options from the menus shown in FIGS. 19A–19E. The mobile station 10 then makes the automatic network selection (FIG. 3B) according to the defined priorities. The selected public system value is stored within a non-volatile portion of memory 24. When power is turned on it is restored and automatic selection is made according to the previously selected priority. The current value is also shown when the user selects this menu option, as is indicated by the change in selected public network between FIGS. 19A and 19F, assuming that the Home Area was selected in FIG. 19E.

It should be noted that if any non-public systems are available these may be selected first, as described below. It should also be noted that the Home-type A may be a default (factory) value. In the example shown in FIGS. 19A to 19F the user's home system is assumed to be A. If it were instead B, the display text is changed accordingly, e.g. Home-type B in FIGS. 19B and 19C.

The Private Networks menu item (FIG. 18C) enables a user to set the priorities of all networks that are selected automatically. The higher the network is located in the list, the higher is its priority. The priority list may be displayed as in the example illustrated in FIGS. 20B to 20F, it being assumed that the Private Networks item is selected in FIG. 20A. With regard to FIG. 20E, all networks below the Out of Use indicator (****) are not scanned and are not selected when the mobile station 10 uses the automatic network selection method, i.e., all networks listed below the Out of Use indicator are barred from use. The only exception is that a barred network can be used if making an emergency call (e.g., 911), only so long as no allowed network can be reached first.

The priority of the networks may be changed by the interaction shown in FIGS. 21A–21G. After this operation the displayed list looks as it is shown in FIGS. 22A–22F. That is, the Public Systems selection (FIG. 21C) has been moved below the Out of Use indicator (FIG. 22E), and the allowed networks are now, in priority order, the Private System 1 (FIG. 22B) and a Residential System (FIG. 22C).

The re-prioritization of the networks is preferably accomplished in a "drag and drop" manner using the mobile station's display 20 and keypad 22. In greater detail, it is first assumed that the menu of FIG. 21A is displayed to the user. In response to depressing the Select key the mobile station 10 displays the menu item of FIG. 21B, that is, the highest priority network. In response to the user depressing the down arrow key ▼ the menu scrolls to the second menu item of FIG. 21C, i.e., the network having the second highest priority. It is noted that when selecting the Private Networks menu the Select soft key indicator in the bottom left corner of the display changes from 'Select' to 'Move'. As such, and in response to the user depressing the Move soft key when the menu of FIG. 21C is displayed, the display indicates (FIG. 21D) that the user desires to move the public network that is located between the private network (FIG. 20B) and the residential network (FIG. 20D) (the up arrow moves up). The Move soft key indicator also changes to "Drop". After depressing the down arrow key ▼ the menu scrolls to show the selected public network located after (i.e., lower in priority than) the residential network (FIG. 22E). After depressing the down arrow key ▼ again the menu scrolls to show the selected public network located after the Out of Use indicator, along with the already barred private network, and thus is also barred from use (FIG. 22F). Depressing the Drop soft key at this time fixes the public network at this position in the priority list (FIG. 22G).

If the user selects the Reset to Default menu item (FIG. 18D) both public network settings and private network settings are set to default values. Suitable default values are, for the public network settings, Home-type A, and for the private network settings, all residential networks first, then all private networks, and then the public systems according to the public network settings. No networks are barred by the mobile station 10 as a result of selecting Reset to Default menu item. That is, the Out of Use indicator is positioned after the last network in the unified priority list.

The mobile station 10 indicates the selected network's identification (SID) when the mobile station 10 is not in the call mode. The Alpha Tag of the SID/PSID/RSID, if available, is always used, and not the numeric value of the SID. If there is no Alpha Tag defined, the mobile station 10 instead displays the default Alpha Tag. By example, FIG. 23A shows the case of a public system with a defined Alpha Tag, FIG. 23B shows a home system without a defined Alpha Tag, FIG. 23C shows any other public system without a defined Alpha Tag, and FIG. 23D shows any non-public system without a defined Alpha Tag.

It should be noted that, in addition to the system soft indicator, the mobile station's conventional roaming/fixed indicator can be used to indicate whether the servicing system is the user's home system, home-type of system, or non-home type of system.

Reference is now made to FIG. **24** for showing in greater detail a portion of the mobile station **10** of FIGS. **2A** and **2B**. The memory **24** is shown to include a plurality of data blocks 25_1, 25_2, . . . , 25_n, each of which stores information concerning one network. Each NAM supported by the mobile station **10** may have an associated set of data blocks. Each data block **25** stores at least the network ID (e.g., PSID, RSID or SID), depending on the network type, the Alpha Tag if available (or a default Alpha Tag if not available), the network's service list (if available), the network's current priority, the network's access parameters, and any other network-related information that is necessary or useful when operating with the network, such as the System Operator Code (SOC) and the Mobile Country Code (MCC). The data blocks **25** may be initially programmed when the NAM is established, or may be programmed as the result of test registrations performed by the mobile station **10** as described above when searching for new networks. The priority field can store a priority number and/or pointers to other data blocks in a linked list fashion. By example, a network having a third highest priority may have a backwards pointer to the data block storing the second highest priority network and a forward pointer to the data block storing the fourth highest priority network. In this case the reassignment of priorities among networks, such as was described in relation to FIGS. **21A** through **21G**, can be accomplished by revising the forward and backward pointers of the linked list. In any event, the data blocks **25** are managed so as to provide a unified list of prioritized networks and optionally network services to a user of the mobile station **10**.

The memory **24** may also store a currently selected service in block **27**, which can be used when searching for networks that support a user-specified service. It should be noted, however, that the selected service is needed only when selecting a network by service and, as a result, may not need to be stored in memory **24**. The home network is shown stored in block **29**, it being realized that this is actually a part of the stored NAM information. The Do Not Use priority level is shown stored in block **31**, and is reset to a lowest priority level in response to the user selecting the Reset to Default screen in FIG. **18D**. For other cases, such as that illustrated in FIGS. **21A** through **21G**, the block **31** may store a priority level value that is intermediate the highest and lowest priority level, and any networks having a priority below this value are considered to be barred from use. The block **31** can also be a part of the linked list, and any network block to which it has a forward pointer is considered to be barred. It is also within the scope of the invention to instead use at least one bit within each RSID/PSID/SID structure to indicate if the network is allowed.

The controller **18** manages the information stored in the various blocks **25–31** as described above with respect to FIGS. **3A** through **23D**, in cooperation with the display **20**, the keypad **22**, and the mobile station's RF transceiver embodied in blocks **14**, **14***a*, **16**, **16***a*, and the antenna **12**.

Although the various menus and menu operations described above in relation to FIGS. **3A** through **23D** have illustrated several presently preferred methods of this invention, the teaching of this invention is not intended to be limited to only the illustrated menu functions, texts, and interactions. The teaching of this invention is also not intended to be limited for operation with only one particular air interface specification or standard (e.g., IS-136). Furthermore, as cellular systems and their capabilities evolve through time some network types, network features and/or network services may arise that are not presently specified or contemplated. By example, future cellular systems may be capable of offering video services to users. As such, the teaching of this invention as now embodied and described above is not to be construed to be limited to only the described embodiments, but is instead intended to be given a scope commensurate with the scope of the several claims that follow.

That is, while the invention has been particularly shown and described with respect to preferred embodiments thereof, it will be understood by those skilled in the art that changes in form and details may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. A method for operating a mobile station, comprising the steps of:

storing within the mobile station a single, prioritized list of networks that are accessible from the mobile station, the list of networks being capable of including both public and non-public networks;

displaying the list of networks to a user of the mobile station;

in response to an input from the user, re-prioritizing the list of networks; and

in response to a further input from the user, attempting to register the mobile station with the highest priority network, wherein

the step of re-prioritizing includes a step of assigning a network to a priority that is less than a threshold priority below which the network is not accessed unless a call to a predetermined number is being made by the user.

2. A method as set forth in claim **1**, and in response to a further input from the user, re-prioritizing the list of networks to a default priority.

3. A method as set forth in claim **2**, wherein the default priority is all residential networks, followed by all private networks, followed by all public networks.

4. A method as set forth in claim **1**, and in response to a further input from the user, displaying an identification of a network to the user and, in response to further input from the user, displaying to the user a list of services that are supported by the displayed network.

5. A method for operating a mobile station, comprising the steps of:

storing within the mobile station a prioritized list of networks that are accessible from the mobile station, the list of networks being capable of including both public and non-public networks;

in response to an input from the user, re-prioritizing the list of networks;

in response to another input from the user, attempting to register the mobile station with the highest priority network, wherein

the step of re-prioritizing includes a step of assigning a network to a priority that is less than a threshold priority below which the network is not accessed unless a call to a predetermined number is being made by the user;

in response to further input from the user, displaying a list of services that are supported by at least some networks of the list; and

in response to the user selecting one of the services from the list of services, displaying an identification of at least one network that supports the selected service.

6. A method as set forth in claim 5, and in response to a further input from the user, attempting to register the mobile station with the network that supports the selected service.

7. A method as set forth in claim 5, and in response to a further input from the user, operating a transceiver of the mobile station to attempt to locate at least one other network, that is currently not a part of the list of networks, and that supports the selected service; and displaying an identification of at least one located network to the user.

8. A method as set forth in claim 7, and further comprising a step of adding the at least one located network to the list of networks.

9. A method for operating a mobile station, comprising the steps of:

maintaining within the mobile station a list of networks, the list of networks being capable of including both public and non-public networks;

in response to an input from the user, displaying a list of services that are supported by at least some networks of the list, the list of services comprising a video service; and

in response to the user selecting one of the services from the list of services, displaying an identification of at least one network from the list of networks that supports the selected service.

10. A method for operating a mobile station, comprising the steps of:

storing within the mobile station a prioritized list of networks that are accessible from the mobile station, the list of networks being capable of including both public and non-public networks;

in response to an input from the user, displaying identifications of networks from the list of networks, the networks being displayed in order from a highest priority to a lowest priority;

in response to a further input from the user, re-prioritizing the list of networks;

in response to another input from the user, attempting to register the mobile station with the highest priority network, wherein

the step of re-prioritizing includes a step of assigning a network to a priority that is less than a threshold priority below which the network is not accessed unless a call to a predetermined number is being made by the user;

in response to a further input from the user, operating a transceiver of the mobile station to attempt to locate at least one other network, that is currently not a part of the list of networks; and

displaying an identification of at least one located network to the user.

11. A method as set forth in claim 10, and in response to a further input from the user, attempting to register the mobile station with the at least one located network.

12. A method as set forth in claim 10, and further comprising a step of adding the at least one located network to the list of networks.

13. A method for operating a mobile station, comprising the steps of:

storing within the mobile station a prioritized list of networks that are accessible from the mobile station, the list of networks being capable of including both public and non-public networks;

in response to an input from the user, re-prioritizing the list of networks;

in response to another input from the user, attempting to register the mobile station with the highest priority network, wherein

the step of re-prioritizing includes a step of assigning a network to a priority that is less than a threshold priority below which the network is not accessed unless a call to a predetermined number is being made by the user;

in response to a further input from the user, displaying a list of services that are supported by at least some networks of the list;

in response to another input from the user, operating a transceiver of the mobile station to attempt to locate at least one other network that supports a service that is currently not listed in the list of services; and

updating and displaying the list of services so as to show the service supported by the located network.

14. A method as set forth in claim 13, and further comprising a step of adding the at least one located network to the list of networks.

15. A mobile station comprising an RF transceiver, a display, and a user input device, said mobile station further comprising:

a memory for storing a single, prioritized list of networks that are accessible from the mobile station through the RF transceiver, the list of networks being capable of including both public and non-public networks; and

control means coupled to said memory, said display, said user input device, and said RF transceiver, said control means being responsive to a first input signals from said user input device for displaying the list of networks to a user of the mobile station, said control means being further responsive to second input signals from said user input device for re-prioritizing the list of networks; and being further responsive to third input signals from said user input device for attempting to register the mobile station with the highest priority network; wherein

said control means is further operable for displaying an indication of a type or types of services provided by at least some of the networks.

16. A mobile station as set forth in claim 15, wherein said control means is responsive to further input signals from said user input device for re-prioritizing the list of networks to a default priority.

17. A mobile station as set forth in claim 16, wherein the default priority is all residential networks, followed by all private networks, followed by all public networks.

18. A mobile station comprising an RF transceiver, a display, and a user input device, said mobile station further comprising:

a memory for storing a single, prioritized list of networks that are accessible from the mobile station through the RF transceiver, the list of networks being capable of including both public and non-public networks; and

control means coupled to said memory, said display, said user input device, and said RF transceiver, said control means being responsive to a first input signals from said user input device for displaying the list of networks to a user of the mobile station, said control means being further responsive to second input signals from said user input device for re-prioritizing the list of

networks; and being further responsive to third input signals from said user input device for attempting to register the mobile station with the highest priority network, wherein

said control means is responsive to further input signals from said user input device for displaying an identification of a network to the user and for displaying a list of services to the user that are supported by the displayed network.

19. A mobile station comprising an RF transceiver, a display, and a user input device, said mobile station further comprising:

a memory for storing a single, prioritized list of networks that are accessible from the mobile station through the RF transceiver, the list of networks being capable of including both public and non-public networks; and

control means coupled to said memory, said display, said user input device, and said RF transceiver, said control means being responsive to a first input signals from said user input device for displaying the list of networks to a user of the mobile station, said control means being further responsive to second input signals from said user input device for re-prioritizing the list of networks; and being further responsive to third input signals from said user input device for attempting to register the mobile station with the highest priority network, wherein

said control means is responsive to further input signals from said user input device for displaying a list of services that are supported by at least some networks of the list; and in response to the user selecting one of the services from the list of services, for displaying an identification of at least one network that supports the selected service.

20. A mobile station as set forth in claim 19, wherein said control means is responsive to further input signals from said user input device for operating said transceiver to attempt to locate at least one other network, that is currently not a part of the list of networks, and that supports the selected service; and for displaying an identification of at least one located network to the user.

21. A mobile station comprising an RF transceiver, a display, and a user input device, said mobile station further comprising:

a memory for storing a single, prioritized list of networks that are accessible from the mobile station through the RF transceiver, the list of networks being capable of including both public and non-public networks; and

control means coupled to said memory, said display, said user input device, and said RF transceiver, said control means being responsive to a first input signals from said user input device for displaying the list of networks to a user of the mobile station, said control means being further responsive to second input signals from said user input device for re-prioritizing the list of networks; and being further responsive to third input signals from said user input device for attempting to register the mobile station with the highest priority network, wherein

said control means is responsive to further input signals from said user input device for displaying a list of services that are supported by at least some networks of the list; and in response to an input from the user, for operating said transceiver to attempt to locate at least one other network that supports a service that is currently not listed in the list of services; and for updating and displaying the list of services so as to show the service supported by the located network.

22. A method for operating a mobile station, comprising the steps of:

maintaining within the mobile station a list of networks, the list of networks being capable of including both public and non-public networks;

in response to an input from the user, displaying a list of services that are supported by at least some networks of the list, the list of services comprising at least one of messaging services, data services, and facsimile services; and

in response to the user selecting one of the services from the list of services, displaying an identification of at least one network from the list of networks that supports the selected service.

23. A method as set forth in claim 22, and in response to a further input from the user, attempting to register the mobile station with the network that supports the selected service.

24. A method as set forth in claim 22, and in response to a further input from the user, operating a transceiver of the mobile station to attempt to locate at least one other network, that is currently not a part of the list of networks, and that supports the selected service; and displaying an identification of at least one located network to the user.

25. A method as set forth in claim 24, and further comprising a step of adding the at least one located network to the list of networks.

26. A method for operating a mobile station, comprising the steps of:

storing within the mobile station a prioritized list of networks that are accessible from the mobile station, the list of networks being capable of including both public and non-public networks;

displaying the list of networks to a user of the mobile station by displaying text on a display of the mobile station;

in response to an input from the user, re-prioritizing the list of networks; and

in response to a further input from the user, attempting to register the mobile station with the highest priority network; wherein

the step of re-prioritizing is accomplished using a drag and drop technique by manipulating at least one mobile station keypad key so as to move displayed text on the display of the mobile station.

27. A method as in claim 26, wherein the step of re-prioritizing includes a step of assigning a network to a priority that is less than a threshold priority below which the network is barred from access unless a call to a predetermined number is being made by the user, and if a non-barred network cannot be reached first.

* * * * *

US006624809B1

(12) **United States Patent**
Kowaguchi

(10) **Patent No.: US 6,624,809 B1**
(45) **Date of Patent: Sep. 23, 2003**

(54) **DISPLAYED INFORMATION MANAGEMENT METHOD**

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(73) Assignee: **NEC Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/457,804**

(22) Filed: **Dec. 9, 1999**

(30) **Foreign Application Priority Data**

Dec. 10, 1998 (JP) 10/351897

(51) **Int. Cl.**[7] **G09G 5/00**

(52) **U.S. Cl.** **345/169**; 379/93.23; 455/461; 455/158.4; 455/166.1

(58) **Field of Search** 345/169, 901; 379/93.23, 354; 455/461, 464, 158.4, 158.5, 166.1, 166.2

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JP	10-136075	5/1998

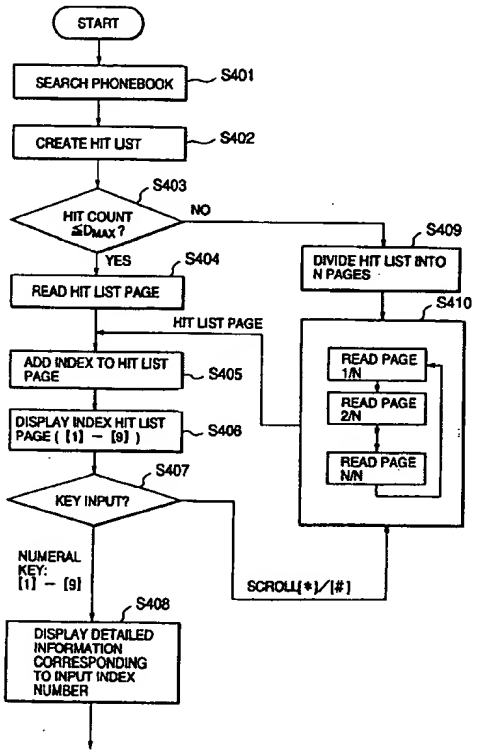
* cited by examiner

Primary Examiner—Bipin Shalwala
Assistant Examiner—Jimmy H. Nguyen
(74) *Attorney, Agent, or Firm*—Scully, Scott, Murphy & Presser

(57) **ABSTRACT**

A displayed information management method allowing easy operation of a portable communication apparatus is disclosed. After selecting data from a set of data according to a desired condition inputted through a ten-key pad, a sequential index number is added to each piece of selected data. The sequential index number is not greater than a maximum number of lines displayable on the display. Each piece of the selected data accompanied with a sequential index number is displayed on the display. A desired piece of selected data is selected by a user inputting a sequential index number accompanying the desired piece of selected data through the ten-key pad.

1 Claim, 9 Drawing Sheets



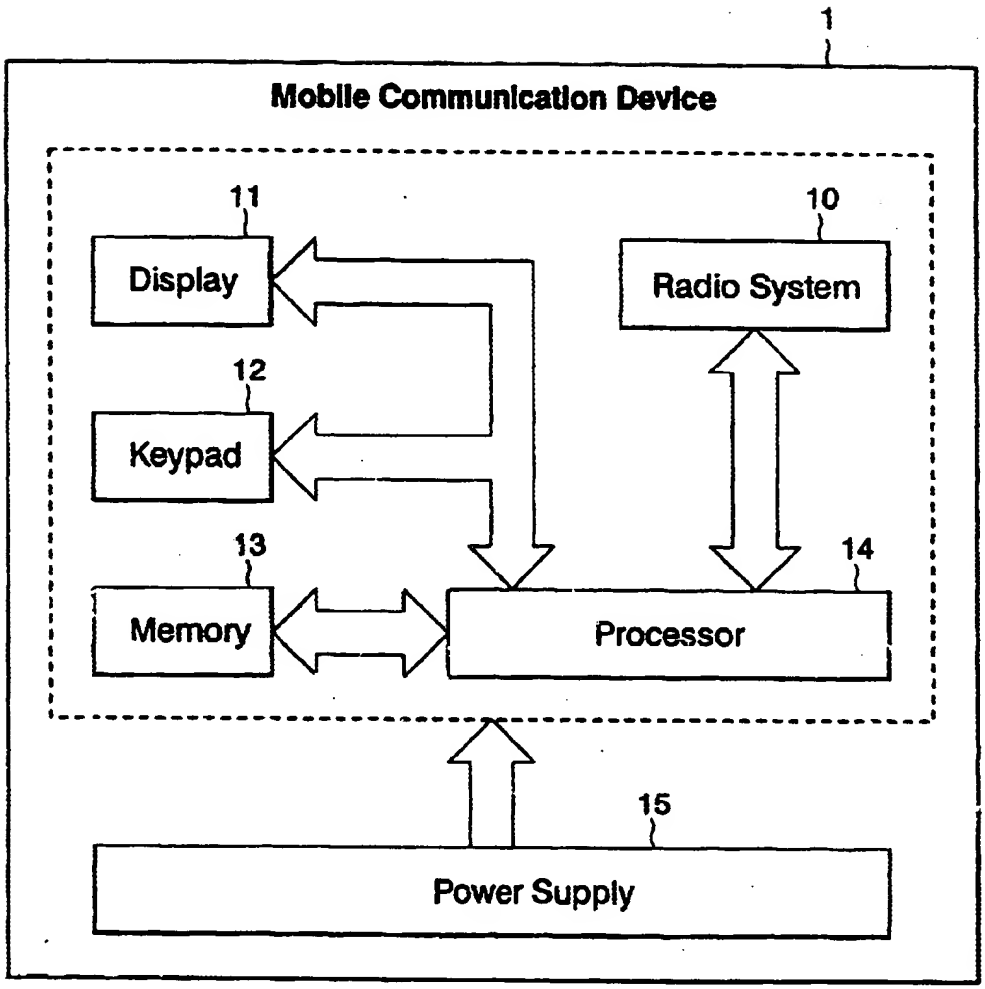

1
Mobile Communication Device
11
Display
10
Radio System
12
Keypad
13
Memory
14
Processor
15
Power Supply

FIG. 1

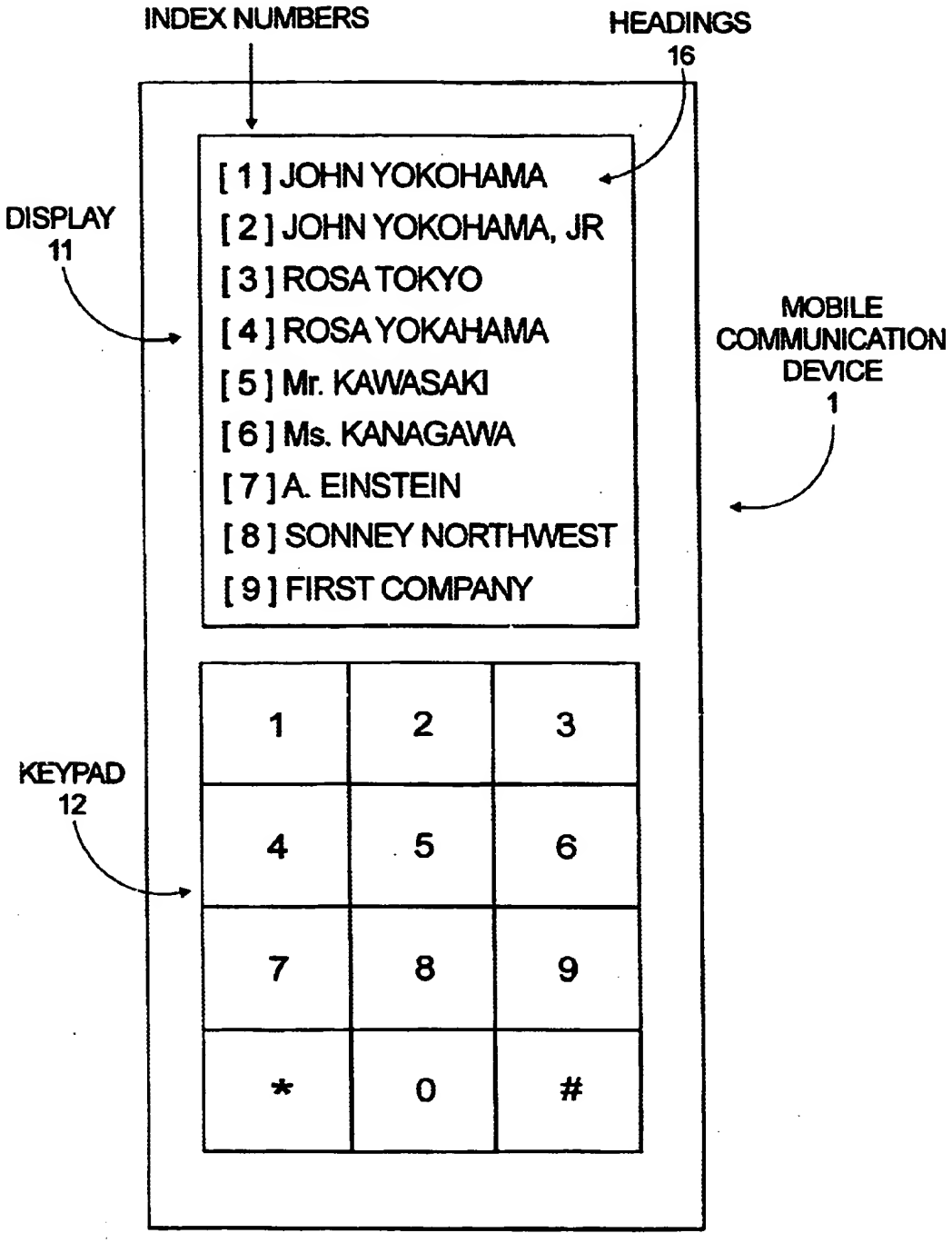

INDEX NUMBERS
HEADINGS
16
DISPLAY
11
[1] JOHN YOKOHAMA
[2] JOHN YOKOHAMA, JR
[3] ROSA TOKYO
[4] ROSA YOKAHAMA
[5] Mr. KAWASAKI
[6] Ms. KANAGAWA
[7] A. EINSTEIN
[8] SONNEY NORTHWEST
[9] FIRST COMPANY
MOBILE COMMUNICATION DEVICE
1
KEYPAD
12
1
2
3
4
5
6
7
8
9
*
0
#

FIG. 2

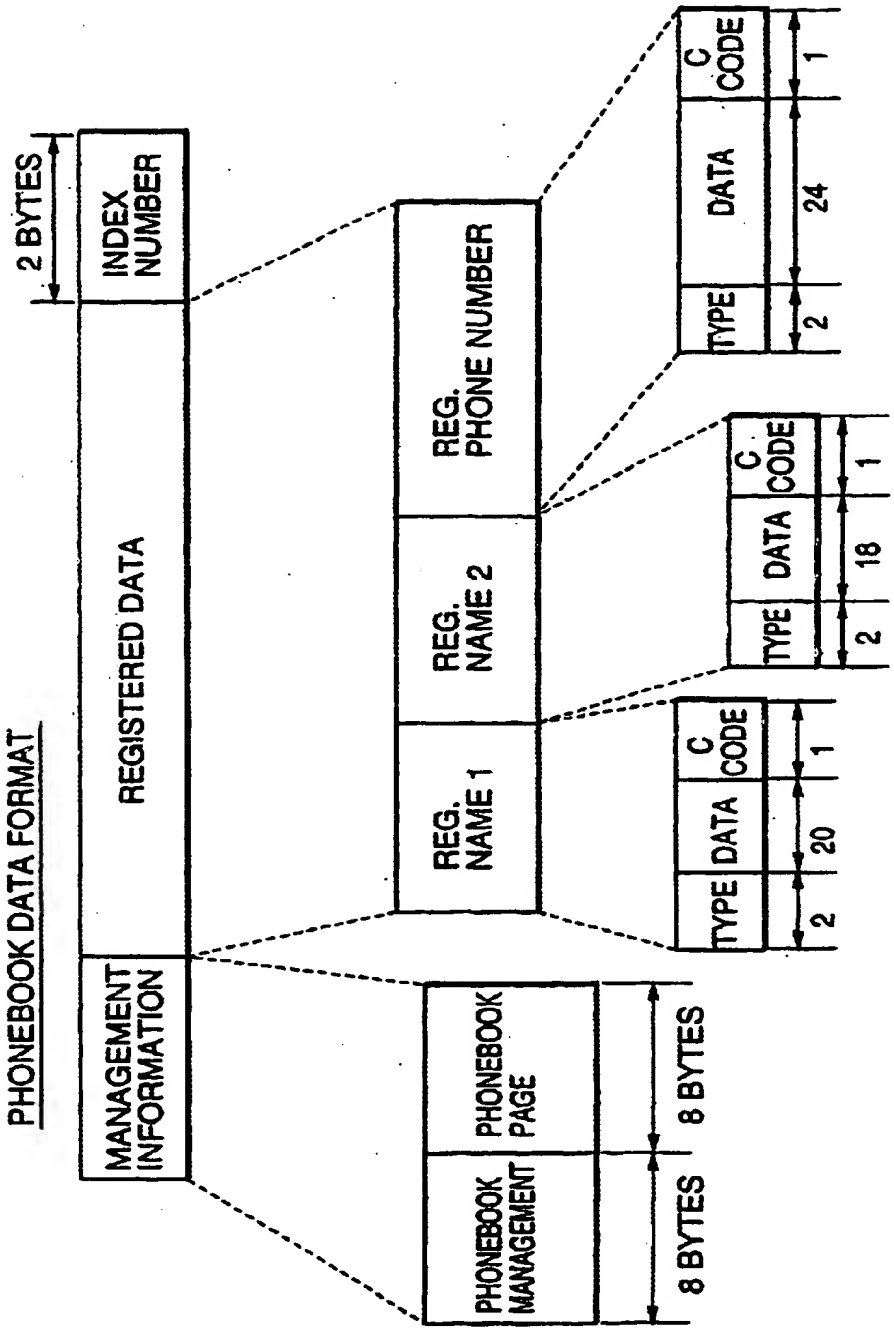

PHONEBOOK DATA FORMAT
2 BYTES
INDEX NUMBER
REGISTERED DATA
MANAGEMENT INFORMATION
REG. NAME 1
REG. NAME 2
REG. PHONE NUMBER
PHONEBOOK PAGE
PHONEBOOK MANAGEMENT
8 BYTES
8 BYTES
TYPE
DATA
C CODE
2
20
1
2
18
1
2
24
1

FIG. 3

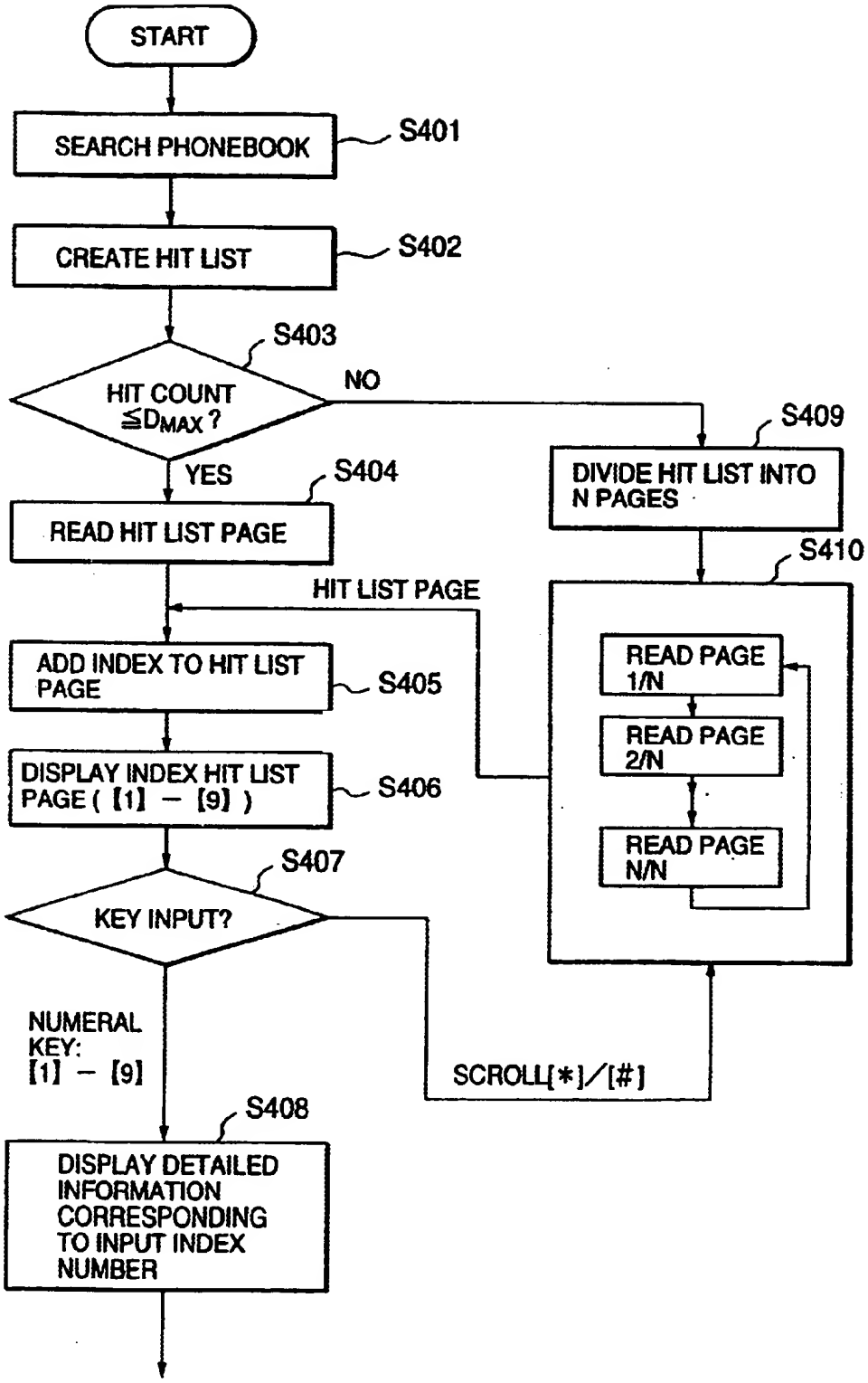

START
SEARCH PHONEBOOK
S401
CREATE HIT LIST
S402
S403
HIT COUNT ≦DMAX ?
NO
YES
S404
READ HIT LIST PAGE
S409
DIVIDE HIT LIST INTO N PAGES
S410
HIT LIST PAGE
ADD INDEX TO HIT LIST PAGE
S405
DISPLAY INDEX HIT LIST PAGE ([1] – [9])
S406
S407
KEY INPUT?
READ PAGE 1/N
READ PAGE 2/N
READ PAGE N/N
NUMERAL KEY: [1] – [9]
SCROLL[*]/[#]
S408
DISPLAY DETAILED INFORMATION CORRESPONDING TO INPUT INDEX NUMBER

FIG. 4

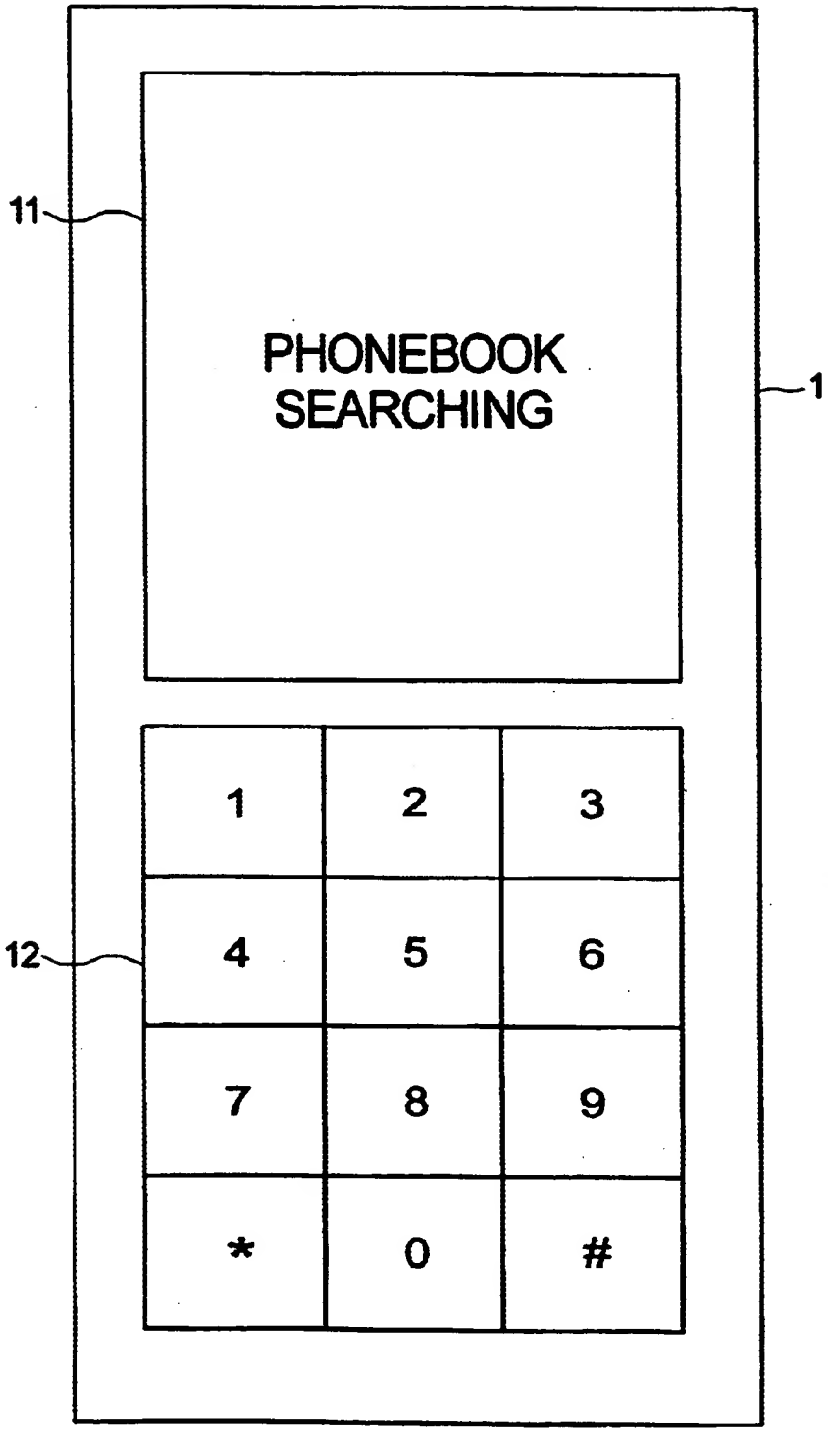
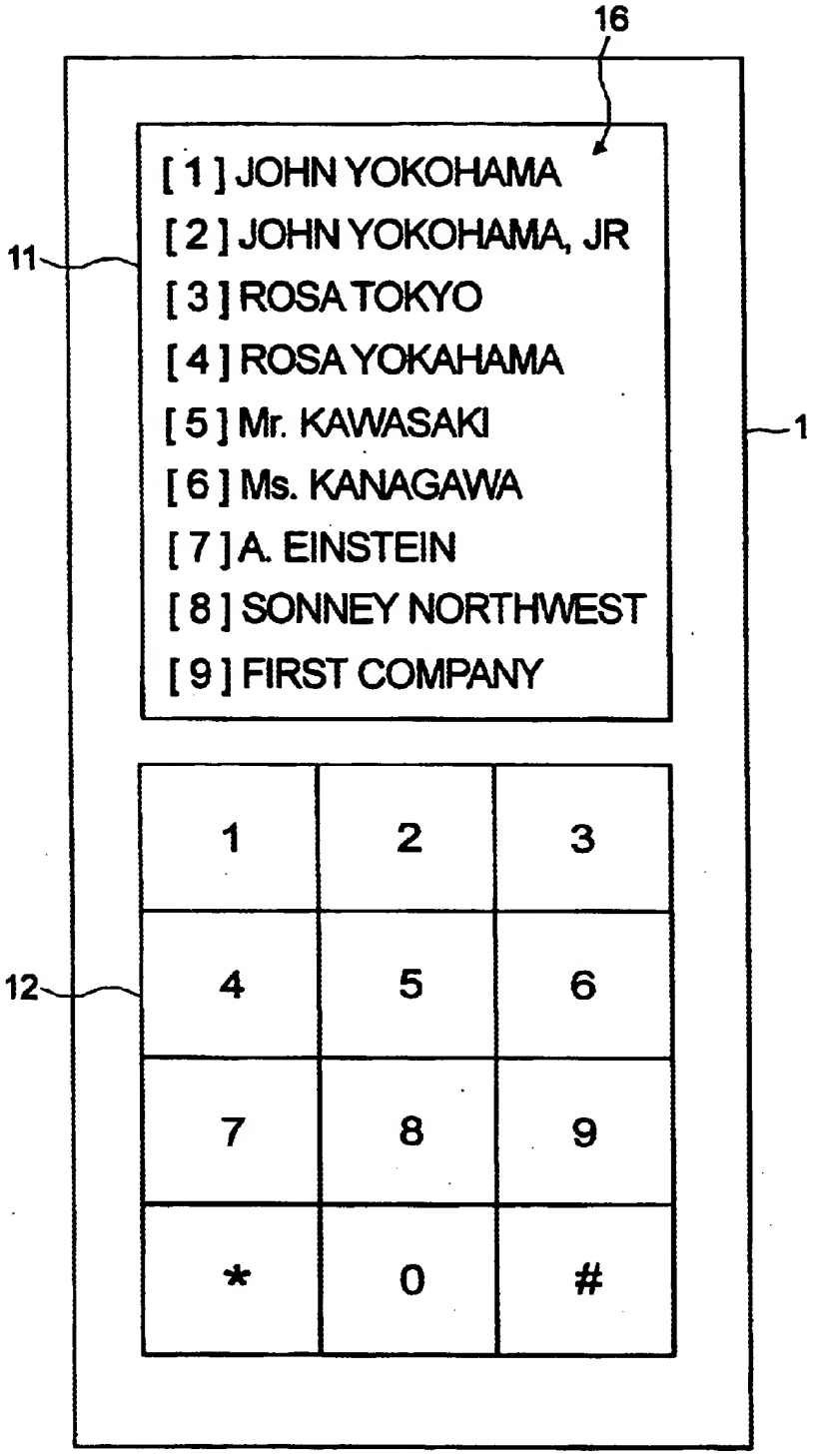
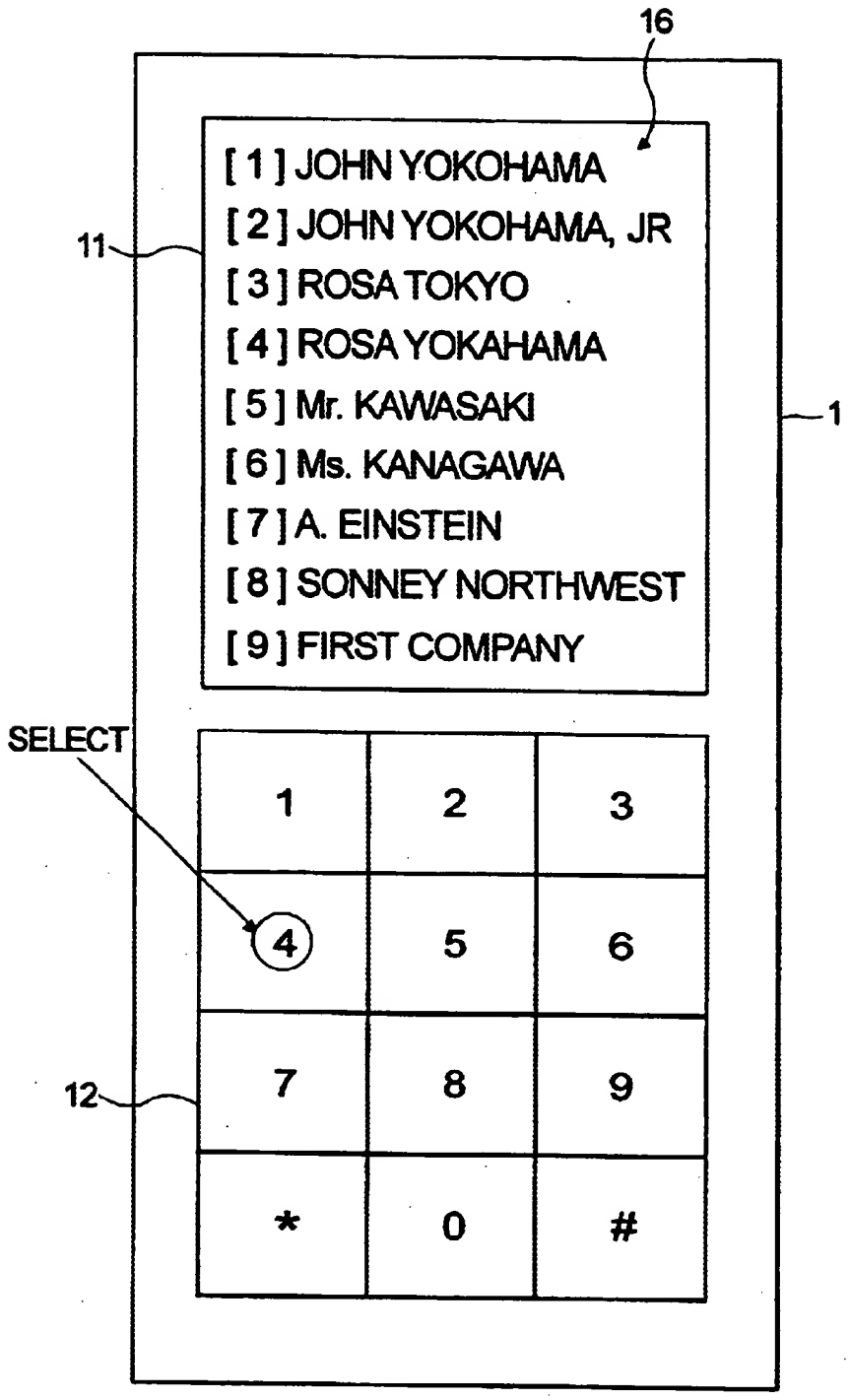


FIG. 5A



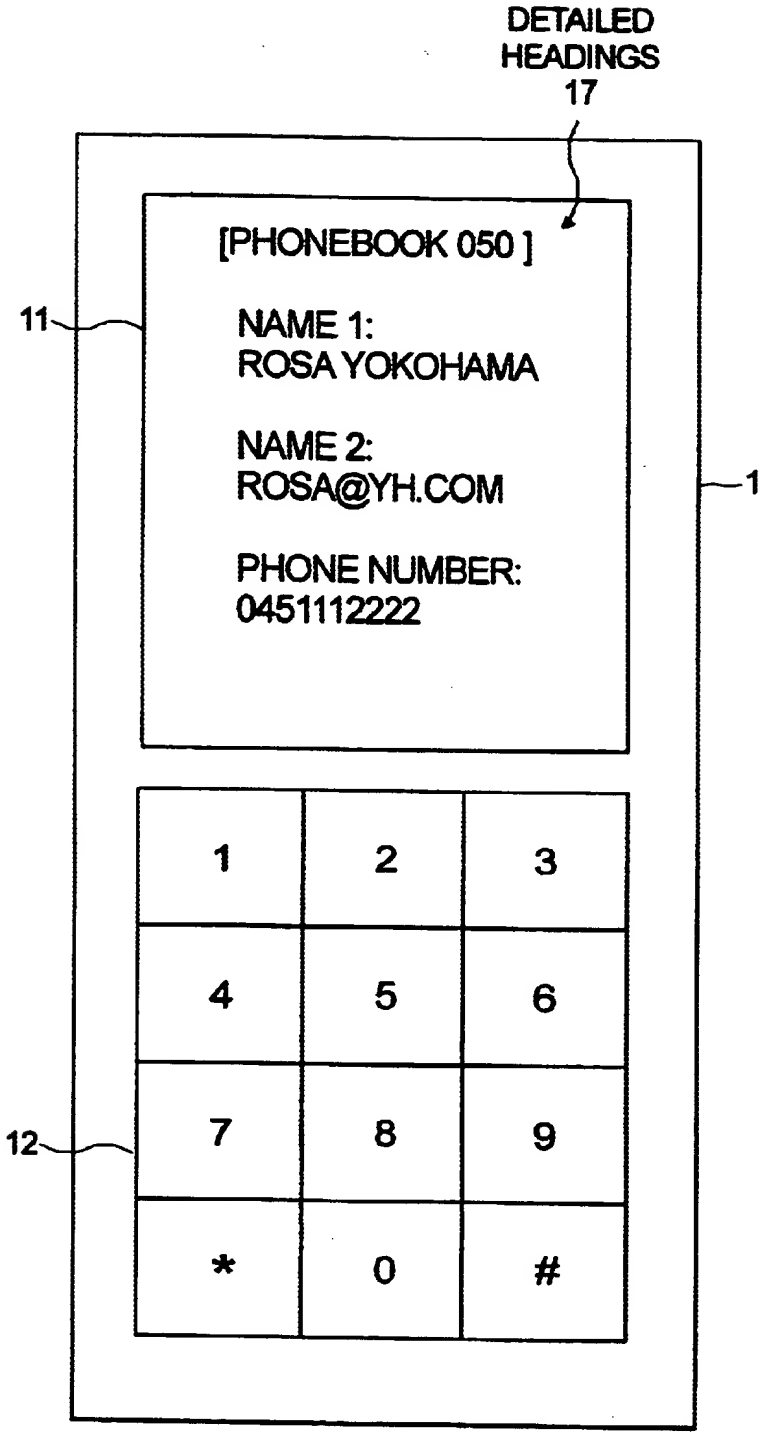
HIT LIST PAGE DISPLAY

FIG. 5B



INDEX NUMBER SELECTION

FIG. 5C



DISPLAY DETAILED INFORMATION

FIG. 5D

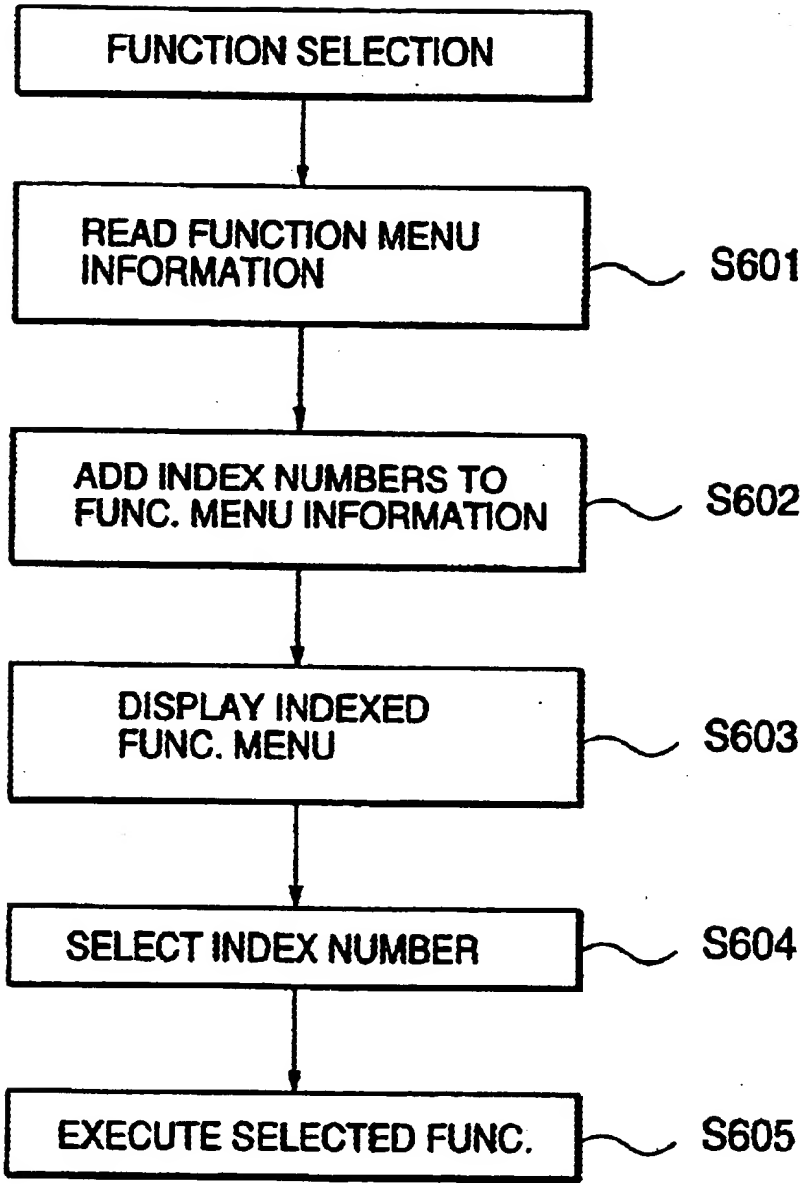

FUNCTION SELECTION
READ FUNCTION MENU INFORMATION
S601
ADD INDEX NUMBERS TO FUNC. MENU INFORMATION
S602
DISPLAY INDEXED FUNC. MENU
S603
SELECT INDEX NUMBER
S604
EXECUTE SELECTED FUNC.
S605

FIG. 6

DISPLAYED INFORMATION MANAGEMENT METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a portable communication device such as a mobile telephone, and in particular to a method for managing displayed information to allow easy operation.

2. Description of the Related Art

A mobile telephone such as a cellular phone or a PHS (Personal Handy-phone System) terminal has been widely used. The mobile telephone preferably reduces in size and weight with an eye to its portability and is preferably multifunctional and intelligent. In general, a multifunctional and intelligent mobile telephone burdens its user with complicated operations, resulting in impaired operability. In the case of a mobile telephone having a phonebook function, for example, the larger the number of registered records, the more the time required for searching.

There have been proposed several techniques to improve the operability of a mobile telephone. Japanese Patent Unexamined Publication No. 10-124530 discloses a method for searching a large amount of data for target data. More specifically, when a user selects the nearest one to the target data from headings displayed on screen, the data number of the selected heading is set to an index I existing in a processor. Then, each time a next screen is desired, a predetermined number of headings with the center of the index I are displayed on screen together with the respective index numbers.

Japanese Patent Unexamined Publication No. 10-136075 discloses a method for accessing a target entry of a set of data. More specifically, when a character is selected, the set of data is searched for an entry including the selected character. If such an entry is found, the entry is displayed on screen and, if necessary, the entry is allowed to be corrected by the user. Then, the set of data is repeatedly searched for the found entry or the corrected entry as described above until the target entry has been found.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a displayed information management method that can achieve easy operation of a multifunctional and intelligent device

According to the present invention, a method for managing information in a portable communication apparatus including a memory, an input device, and a display, the method comprising the steps of:

a) selecting data from a set of data according to a desired condition inputted through the input device:

b) adding a sequential index number to each piece of selected data, wherein the sequential index number is not greater than a maximum number of lines displayable on the display:

c) displaying each piece of the selected data accompanied with a sequential index number on the display; and

d) selecting a desired piece of selected data by inputting a sequential index number accompanying the desired piece of selected data through the input device.

The input device preferably includes a ten-key pad which is used to input a sequential index number to select a desired piece of selected data. The sequential index number may be a number corresponding to a key of the ten-key pad.

The set of data may be a phonebook which retrievably contains a plurality of phone data records, each of the phone data records including a plurality of data items.

The selected data may be a set of phone data records retrieved from the phonebook according to a desired keyword, wherein data items of the selected phone data records corresponding to the desired keyword are displayed as headings. A desired one of the data items of the selected phone data records is selected by inputting a sequential index number accompanying the desired one through the input device, so that all data items of a phone data record including the desired one are displayed on the display.

The set of data may be function menu information which retrievably contains a plurality of functions. The selected data is a set of functions retrieved from the function menu information according to a desired keyword. A desired function of the selected functions is selected by inputting a sequential index number accompanying the desired one through the input device, so that the desired function is executed.

According to anoterh aspect of the present invention, a method for managing information in a portable communication apparatus including a memory, an input device, and a display, the method comprising the steps of:

selecting data from a set of data according to a desired condition inputted through the input device;

determining whether a number of pieces of selected data is not greater than a maximum number of lines displayable on the display;

when the number of pieces of selected data is greater than the maximum number of lines displayable on the display, dividing the selected data Into a plurality of pages each containing a number of pieces of selected data which is not greater than the maximum number of lines displayable on the display;

sequentially selecting a page from the plurality of pages through the input device;

adding a sequential index number to each piece of selected data in a selected page;

displaying each piece of the selected data accompanied with a sequential index number in the selected page on the display; and

selecting a desired piece of selected data by inputting a sequential index number accompanying the desired piece of selected data through the input device.

As described above, according to the present invention, the selected data is indexed and displayed on the display. Therefore, a user can easily obtain a desired piece of data by directly selecting an index number corresponding to the desired piece of displayed data through the input device. Even if the portable communication apparatus becomes more intelligent and multifunctional, the user can easily operate such a portable communication apparatus, so that mistakes are avoided and the time required for necessary operation is reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram showing a radio mobile telephone implementing an information management method according to the present invention;

FIG. **2** is a plan view showing the radio mobile telephone having a display and a keypad;

FIG. **3** is a diagram showing a phonebook data format of a record;

FIG. **4** is a flowchart showing an index management operation according to an embodiment of the present invention;

FIG. 5A is a plan view of the radio mobile telephone when searching a phonebook:

FIG. 5B is a plan view of the radio mobile telephone when a hit list page is displayed on screen;

FIG. 5C is a plan view of the radio mobile telephone when one of the index numbers is selected;

FIG. 5D is a plan view of the radio mobile telephone when the detailed information for the selected index number is displayed: and

FIG. 6 is a flowchart showing an index management operation according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is shown a mobile telephone having a phonebook function in accordance with the present invention. The mobile telephone is provided with a radio system 10 that transmits and receives a radio signal to and from a radio base station (not shown). The mobile telephone is further provided with a display 11, a keypad 12, a memory 13, a processor 14, and a power supply 15.

The keypad 12 includes a ten-key pad consisting of numerals "0"–"9", "*" and "#". The keypad 12 is used to input a phone number and various commands. Here, the display 11 may be a liquld-crystal display (LCD) with a relatively large area screen to display necessary information. The memory 13 stores phonebook data and control programs including an information management program which is used to perform the index management.

The processor 14 is a program-controlled processor such as a central processing unit (CPU). A control program for the mobile telephone is stored in the memory 13 and runs on the processor 14 to control the operations of the mobile telephone including transmission and reception operations, phonebook searching operation, and an index management operation as described later.

Referring to FIG. 2, the radio mobile telephone according to the present invention is provided with a relatively large area display 11. In this embodiment, the maximum number of data lines displayed on the display 11, Dmax, is set to 9. As shown in FIG. 2, the respective pieces of name data, or headings 16, accompanied by index numbers [1] through [9] are displayed on the display 11. The keypad 12 is provided immediately below the display 11 so that the user can operate the ten-key pad while looking at the display 11.

As shown in FIG. 3, a record of phonebook data has a format consisting of a management information field, a registered data field, and an index number field. The management information field is composed of an 8-byte phonebook management field and an 8-byte phonebook page field. The registered data field is composed of a first name field, a second name field, and a phone number field. The first name field is further composed of a 2-byte type field, a 20-byte data field, and a 1-byte control code field. The second name field is further composed of a 2-byte type field, an 18-byte data field, and a 1-byte control code field. The phone number field is further composed of a 2-byte type field, a 24-byte data field, and a 1-byte control code field. The index number field is of 2 bytes, which is used to search the phonebook.

The first and second name fields may be used in a different way. For example, the first name field is used to store Japanese-word (kanji) characters of a personal name and the second name field is used to store its phonetic (kana) characters.

The phonebook data as described above are retrievably stored in the memory 13 and the retrieved pieces of phonebook data are displayed on the display 11 as described hereafter.

INDEX MANAGEMENT

Referring to FIG. 4, when the user instructs the phonebook searching with a key word through the keypad 12, the processor 14 starts the search program running thereon (step S401). One or more of the first name, the second name, and the phone number can be used as a search condition. If at least one hit is found in the phonebook, hit data is read out from the phonebook to create a hit list (step S402).

Thereafter, the processor 14 starts a display information management program to display the hit list so as to allow easy operation. First, it is determined whether the number of hits is not greater than the maximum count Dmax (step S403). In the case where the number of hits is not greater than the maximum count Dmax (YES in step S403), the hit list is read out as one page (step 5404) and then index numbers [1]–[9] for easy operation are added to the records included in the hit list page, respectively (step S405). The indexed hit list page is displayed on the display 11 (step S406).

Then, it is determined whether a key of the ten-key pad is pushed (step S407). If one of the numeral keys [1]–[9] of the ten-key pad is selected as a direct key, the processor 14 reads the detailed data of the record corresponding to the selected index number and displays the detailed data on the display 11 (step S408). In this manner, If the user wants more detailed information of a displayed item to be displayed, the user selects the corresponding one of the index numbers by pushing the ten-key of the index number corresponding to the desired item. If a symbol key "*" or "#" of the ten-key pad is selected in the step S407, the processor 14 calls a page scroll routine (step S410) as described later.

On the other hand, when the number of hits is greater than the maximum count Dmax (NO in step S403), the hit list is divided into N pages each including Dmax or less items, where N is an integer greater than 1 (step S409). In the case of Dmax=9 and 90 hits found, the hit list is divided into 10 pages. Then, a first page (1/N) is read out as a hit list page (S410) and then the steps S405–S407 are performed as described above. If one of the numeral keys [1]–[9] of the ten-key pad is selected as a direct key in the step S407, the processor 14 reads the detailed data of the record corresponding to the selected index number and displays the detailed data on the display 11 (step S408).

If a symbol key "*" or "#" of the ten-key pad is selected in the step S407, the processor 14 calls a page scroll routine (step S410). Here, when the symbol key "*" is pushed, the next page is read out as a hit list page and, when the symbol key "#" is pushed, the previous page is read out as a hit list page. In other words, each time one of the symbol keys "*" and "#" of the ten-key pad is selected in the step S407, the page scroll is performed. When a hit list page is read out in this way, the steps S405–S408 are performed as described above.

As shown in FIG. 5A, the phonebook search is performed by using the first name as a key word. Then, a hit list is created and indexed as described above. The indexed hit list is displayed on the display 11 as shown in FIG. 5B. For example, the name "John Yokohaman" is accompanied by index number "1", the name "John Yokohama, Jr" is accompanied by index number "2", and so on. In the case of 10 or more hits, the symbol key "*" or "#" of the ten-key pad is used to scroll by page, as described before.

In the case where the user needs more detailed information about "Rosa Yokohama" accompanied by the index number "4", the user pushes the key labeled "4" of the ten-key pad as shown in FIG. 5C. In other words, the key labeled "4" labeled the same numeral as the index number is selected. When the key labeled "4" of the ten-key pad is pushed, the detailed data, or detailed headings **17**, that is, the second name and the phone number of "Rosa Yokohama" corresponding to the selected index number "4" are further displayed as shown in FIG. 5D.

In this manner, since the displayed list is indexed on the display **11**, the user can easily obtain detailed information by directly selecting an index number corresponding to target information through the ten-key pad. Therefore, even if the mobile telephone becomes more intelligent and multifunctional, the user can easily operate such a mobile telephone, so that mistakes are avoided and the time required for necessary operation is reduced.

The present invention is also applicable to another selection operation, for example, a function selection operation such that a desired function is selected from many function items displayed on the display of a mobile telephone. The detail will be described hereafter with reference to FIG. 6.

Referring to FIG. 6, in a function selection mode, function menu information is read from the memory (step **S601**) and then is indexed to create a function menu management list (step **S602**). The indexed function menu is displayed on the display such that a different index number is added to each function item of the function menu (step **S603**). In the case of the display screen displayable to a maximum of nine lines, an index number ranges from 1 to 9. When one numerical key of the ten-key pad corresponding to the index number of a desired function is selected by the user pushing that numerical key (step **S604**), the selected function is executed (step **S605**).

In this manner, even in the case of the multifunctional and intelligent mobile telephone requiring complicated function operations, the index management method according to the present invention allows easy operation.

What is claimed is:

1. A method for managing information in a portable communication apparatus including a memory, an input device including a ten-key pad, and a display, the method comprising the steps of:

selecting data from a set of data according to a desired condition inputted through the input device;

determining whether a number of pieces of selected data is not greater than a maximum number of alphanumeric character lines displayable on the display; when the number of pieces of selected data is greater than the maximum number of alphanumeric character lines displayable on the display, dividing the selected data into a plurality of pages each containing a number of pieces of selected data which is not greater than the maximum number of alphanumeric character lines displayable on the display;

sequentially selecting a page from the plurality of pages through the input device;

adding a sequential index number to each piece of selected data in a selected page;

displaying each piece of the selected data accompanied with a sequential index number in the selected page on the display; and

selecting a desired piece of selected data by operating a numeral key of the ten-key pad corresponding to a sequential index number accompanying the desired piece of selected data through the input device.

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